University of Alberta

Physical Activity and Type 2 Diabetes: Exploring the Role of Gender and Socioeconomic Status

by

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ABSTRACT

Physical activity (PA) plays a key role in the management of type 2 diabetes (T2DM). Despite this, there is a limited understanding of the social-cognitive determinants of PA behaviour among adults with T2DM. In Study One (N=1614), surveys were analyzed to determine whether: 1) PA behaviour, and 2) selected Social Cognitive Theory (SCT) constructs and item-beliefs associated with PA, differ across gender and socioeconomic status (SES). In Study Two, interviews (N=20) were conducted to explore: 1) the personal significance of SCT constructs related to PA behaviour, and 2) preferences for PA interventions.

Results from this research revealed that PA behaviour significantly differs within gender and income groups. Further, differences were demonstrated for certain SCT constructs and item-beliefs for gender and SES groups. Moreover, distinct PA preferences were observed based upon demographic characteristics. The implications of these results are provided along with recommendations for future research, practice and policy.

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Chapter 1 – Introduction

1.1 Overview of the chapter

This chapter provides a brief overview of the role of physical activity in the effective management of adults with type 2 diabetes. Further, the utility of the Social Cognitive Theory for exploring determinants of physical activity among this population and the rationale for this research are addressed.

1.2 Introduction

Diabetes mellitus is one of the most troubling chronic diseases and a leading cause of death and disability in Canada (Health Canada, 2002). According to the 1999/2000 National Diabetes Surveillance System (NDSS), 5.1% of Canadians aged 20 years and older have diabetes, with 90% of cases classified as type 2 (Health Canada, 2003). The prevalence, however, and the associated health care costs are projected to increase by approximately 70% between 2000 and 2016 (Ohinmaa, Jacobs, Simpson, & Johnson, 2004).

Physical activity is now well recognized as an important strategy for effective prevention and management of type 2 diabetes (Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (CDA), 2003; Sigal, Kenny, Wasserman, & Castaneda-Sceppa, 2004). Regular participation in physical activity has numerous physiological, psychological and social benefits (CDA, 2003; Sigal et al., 2004). Despite this, 65% of Canadians who report having diabetes and are 20+ years of age are insufficiently active to achieve health benefits (Health Canada, 2002). These high rates of inactivity may, in part, be due to the fact that many people with diabetes report diet and exercise as the most difficult areas of self-treatment (Nelson, Reiber, & Boyko, 2002; Plotnikoff, Brez, & Hotz, 2000; Schultz, Sprague, Branen, & Lambeth, 2001).

One possible explanation for the difficulty in participating in regular physical activity is that people with diabetes report receiving less education, support and encouragement for physical activity, when compared to other aspects of self-treatment (Ruggiero et al., 1997; Wilson et al., 1986). Evidence in the literature, in fact, shows that 25-75% of people with diabetes are not given exercise advice or a specific exercise prescription by their healthcare provider (Krug, Haire-Joshu, & Heady, 1991; Ruggiero et al., 1997). This lack of advice may be because physical activity guidelines are unclear and not well-understood by healthcare providers, thereby sending mixed messages to patients (Tudor-Locke, Bell, & Myers, 2001).

Another possible explanation for low rates of physical activity is that positive benefits from other aspects of self-treatment, such as medication adherence, are more readily observed (Plotnikoff et al., 2000). Subsequently, the delay in noticeable improvements in physical activity may cause many people to become discouraged (Krug et al., 1991). As Glasgow and colleagues' (1989) reported, exercise self-efficacy among people with type 2 diabetes is much lower than self-efficacy scores for other self-care behaviours. Thus, despite the belief that exercise is important, many individuals lack the confidence to engage in physical activity pursuits. It is therefore not surprising that 50% of people with diabetes dropout of a behavior modification program within 3 months, and only 10% are still involved 1 year later (Schneider, Khachadurian, Amorosa, Clemow, & Ruderman, 1992).

Far from promising, however, rates of inactivity within the general population are also high. According to the 2002/03 Canadian Community Health Survey, 51% of Canadians aged 20 years and older fail to participate is sufficient amounts of regular physical activity (Canadian Fitness and Lifestyle Research Institute (CFLRI), 2004). Moreover, rates of inactivity may be even higher among certain population sub-groups, such as women, older adults, those with lower levels of education and income, those with disabilities, and ethnic or racial minorities (Jones et al., 1998; Wen et al., 2002).

It remains a challenge for health practitioners to increase the number of people who participate in regular physical activity to attain health benefits. As a result, research in the physical activity domain largely revolves around exploring determinants of physical activity, including demographic, psychosocial and behavioural factors. Additionally, researchers continue to focus on understanding and predicting physical activity behaviour through the use of behaviour change theories borrowed from health psychology.

Alberta Bandura's (1986) Social Cognitive Theory (SCT) is one of the most popular theories used to explain and predict a variety of health behaviours, including physical activity. A key principle in the SCT is reciprocal determinism, in which human behaviour is defined as triadic, dynamic and bi-directionally interacting between personal, behavioural and environmental factors (Bandura, 1986; Baranowski, Perry, & Parcel, 2002; Dzewaltowski, 1994). There is evidence in the literature pertaining to the general population that selected SCT constructs, such a self-efficacy, outcome expectations, outcome expectancies, self-control and social support, are significantly associated and predictive of physical activity behaviour (Baranowski et al., 2002).

Interventions based on SCT have successfully employed goal-setting, decisional balance sheets, relapse prevention, stimulus control strategies and social support to promote physical activity participation in both clinical and community-based populations (Marcus, King, Clark, Pinto, & Bock, 1996).

The utility of SCT has not been explored extensively among people with diabetes. Notwithstanding, the few studies that do exist demonstrate a relationship between physical activity, and self-efficacy (Kingery & Glasgow, 1989; Padgett, 1991; Skelly, Marshall, Haughey, Davis & Dunford, 1995), outcome expectations (Kingery & Glasgow, 1989), outcome expectancies (Skelly et al., 1995) and social support (Pham, Fortin, & Thibaudeau, 1996; Wilson et al., 1986). Results of interventions utilizing the SCT framework have shown moderate to significant increases in physical activity. For example, Tudor-Locke and colleagues' (2004) operationalized self-efficacy, outcome expectations, social support and self-monitoring with a goal of increasing physical activity through walking. Upon follow-up, significant between-group differences were found, with intervention participants accumulating approximately 31 minutes of extra walking per day.

Results from this intervention and other related studies suggest that various constructs from the SCT can be effectively operationalized to promote physical activity behaviour change (Allen, 2004). Nevertheless, more research is needed to understand the relationship between physical activity and selected constructs, particularly among certain demographic groups of those with diabetes.

1.3 Overall Rationale for the Study

Type 2 diabetes is a chronic disease that has substantial consequences for individuals and society. Accumulating evidence suggests that physical activity is an important strategy for effective management, yet over half of those with the disease are insufficiently active (Health Canada, 2002). SCT offers promise for understanding physical activity behaviours and designing interventions to enhance a more active lifestyle among this population (Allen, 2004).

Knowledge regarding physical activity behaviours and SCT constructs associated with physical activity for people with type 2 diabetes remains incomplete. Moreover, there is a lack of understanding as to whether differences exist in the relationship between SCT constructs and physical activity behaviours among men and women, and those of varying socioeconomic status (SES). Consequently, potential gender and SES differences need to be explored so that interventions can be targeted and tailored to meet the needs of demographic groups among people with type 2 diabetes.

The data gathered from this research study may prove useful for the practitioner to effectively design and implement lifestyle modification interventions in the community. For the individual, successful interventions could contribute to a decrease in cardiovascular disease and other diabetes-related complications. On a broader scale, interventions may help lower overall health care costs attributable to diabetes and improve quality of life for both those living with the disease and their families.

1.4 Overall Aim for the Study

The overall purpose of this research is to examine the role of gender and socioeconomic status on SCT constructs related to physical activity behaviour among adults with type 2 diabetes.

1.5 Plan of Thesis

This thesis is exploratory in nature and employs a mixed-method approach, consisting of two research studies. Study One is a quantitative investigation of surveys to determine whether: 1) self-reported leisure-time physical activity (LTPA), and 2) the strength of potential relationships between LTPA and selected SCT constructs and items, differ for gender, and income and education groups.

Study Two utilizes a qualitative approach, conducting telephone interviews to explore the meaning and personal significance of SCT constructs related to physical activity behaviour among men and women of high and low income. Consequently, the results from this study will: 1) provide a contextual understanding of the quantitative data from Study One; and, 2) examine additional SCT constructs not explored in Study One. Further, Study Two has a subsidiary objective to explore preferences for physical activity interventions among people with type 2 diabetes, in order to make recommendations for the development and implementation of physical activity interventions for this population.

The thesis begins with an introductory chapter (Chapter 1) and a literature review (Chapter 2). Following this, Study One (Chapter 3) and Study Two (Chapter 4) are presented, each containing a specific introduction, methods, results, discussion, limitations and implications. Finally, a conclusion chapter (Chapter 5) summarizes and synthesizes both studies, and provides recommendations and future directions. Instruments for Study One (Appendix I) and Study Two (Appendix II), and ethical approval documentation (Appendix III) are included as appendices.

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Chapter 2 – Literature Review

2.1 Overview of the chapter

The aim of the literature review is to explore salient issues related to physical activity among people with type 2 diabetes and identify gaps within the literature that need to be addressed. The chapter commences with background information about diabetes and its prevalence across gender and socioeconomic status (SES). This is followed by reviewing: (1) lifestyle interventions for the prevention and management of type 2 diabetes; (2) the role of physical activity for effective diabetes management, and current physical activity recommendations and behaviours; (3) determinants of physical activity within both the general and diabetes population, with a specific focus on gender and SES differences in psychosocial determinants; (4) preferences for physical activity interventions; (5) behaviour change theory within the physical activity domain, and the utility of theory-based interventions for people with type 2 diabetes; (6) Social Cognitive Theory (SCT) and it's related constructs for the study of physical activity; and, (7) measurement issues with regard to the SCT and physical activity behaviour.

2.2 Background

2.2.1 Prevalence and Consequences of Diabetes

Diabetes mellitus is a major public health issue in Canada and around the world. In 2000, it was estimated that 171 million people worldwide had diabetes, however, the prevalence is steadily rising and suspected to reach epidemic proportions (Wild, Roglic, Green, Sicree, & King, 2004). This is largely as a result of the aging population, and an increase in obesity, unhealthy eating and inactivity (Kelly & Booth, 2003; Wing et al., 2001).

The increase in prevalence of diabetes worldwide poses serious health, social and economic consequences to the individual and society at large. Individuals with diabetes are at an increased risk of macrovascular and microvascular complications, including retinopathy, nephropathy and neuropathy (Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (CDA), 2003; Health Canada, 2002). Further, individuals with diabetes are at a substantially higher risk for cardiovascular disease, stroke and premature death (American Diabetes Association (ADA) & National Institute for Diabetes, Digestive and Kidney Diseases (NIDDKD), 2002; Ford & Herman, 1995).

Complications resulting from diabetes may impair an individual's quality of life and decrease life expectancy by approximately 13 years (Health Canada, 2002; Kelly & Booth, 2003). Moreover, diabetes-related complications may result in an increase in use of health care services and thus greater direct and indirect costs to the health care system (Barnard, Jung, & Inkeles, 1994; Health Canada, 2002, 2003). As Dawson, Gomes, Gerstein, Blanchard, and Kahler report (2002), the cost of diabetes to the Canadian health care system is approximately $6.25 billion dollars annually.

In Canada, approximately 5.1% of individuals aged 20 years and older have diabetes (Health Canada, 2003). Of all cases, roughly 90-95% are classified as type 2, with those over 65 years accounting for almost 50% of the diabetic population (Health Canada, 2003). The prevalence of diabetes, however, may be even higher as it is speculated that one-third of all people with diabetes go undiagnosed (Health Canada, 2002, 2003). Further, in Canada and other industrialized countries diabetes disproportionately affects certain socio-demographic groups.

2.2.2 Diabetes and Gender

In Canada, the prevalence of diabetes is marginally higher among men (5.4%) than women (4.9%), however the difference is not statistically significant (Health Canada, 2003). The literature does suggest, however, that men and women may experience differential effects of the disease and its related complications. For example, male mortality is higher than female mortality among those with self-report diabetes (Health Canada, 2003). Conversely, women with diabetes are seven times more likely to die from heart disease than women without the disease, whereas for men this risk is only 2 to 3 times greater (Anonymous, 2001). Further, women are disproportionately affected by diabetes–related complications (Summerson, Spangler, Bell, Shelton, & Konen, 1999), and the prevalence of comorbid depression is significantly higher among diabetic women than men (Kelly & Booth, 2003).

2.2.3 Diabetes and SES

In industrialized countries, diabetes is associated with lower SES, as studies report an inverse relationship between SES and the prevalence of type 2 diabetes (Connolly, Unwin, Sheriff, Bilous, & Kelly, 2000; Kumari, Head, & Marmot, 2004). According to the 1998/99 National Population Health Survey, 21.4% of Canadians with diabetes are classified as low income, when only 12.8% from the general population are defined as low income (Health Canada, 2002). Further, 42.7% of those with diabetes do not have a secondary school education, compared to 22.5% of the general population (Health Canada, 2002) The relationship between diabetes and SES may be explained, in part, by the notion that low SES is associated with limited knowledge about available treatment, and decreased access and quality of care, and willingness to seek treatment (Brown et al., 2004; Tang, Chen, & Krewski, 2003). Additionally, research reveals there is a relationship between SES and lifestyle risk factors that may predispose individuals to type 2 diabetes (Connolly et al., 2000).

Studies that have examined the association between SES and reported diabetes indicate such a relationship may differ by gender. Results from the Third National Health and Nutrition Study in the United States report that SES is related to type 2 diabetes prevalence in African-American women, but not consistently among African-American men (Robbins, Vaccarino, Zhang, & Kasl, 2000). Similarly, Canadian data reports that diabetes prevalence is significantly associated with lower levels of income only among women (Tang et al., 2003).

Many of these national surveys are cross-sectional in nature and it is therefore difficult to ascertain whether causal relationships exist between SES and diabetes prevalence (Tang et al., 2003). For example, it is difficult to determine whether low SES increases one's risk of developing diabetes or whether having diabetes may result in lower levels of SES due to related complications which affect one's ability to sustain employment and income.

2.3 Lifestyle Interventions

2.3.1 Diabetes Prevention

Lifestyle and behavioural strategies, which include proper nutrition, physical activity and weight loss, play a key role in the prevention and management of type 2 diabetes (Barnard et al., 1994; Wing et al., 2001). Several large randomized controlled trials have demonstrated lifestyle modifications are effective for preventing or delaying the onset of type 2 diabetes (Knowler et al., 2002; Pan et al., 1997; Tuomilehto et al., 2001).

The Da Qing Impaired Glucose Tolerance and Diabetes Study in China was conducted to determine whether lifestyle interventions could delay or reduce the incidence of type 2 diabetes for those with impaired glucose tolerance (Pan et al., 1997). In this study, 577 subjects were randomized into a control or one of three treatment conditions (diet only, exercise only, diet plus exercise). Upon 6-year follow-up, the incidence of diabetes was 44% in diet only, 41% in exercise only, 46% in diet plus exercise and 68% in control. These results demonstrated that all three treatment groups had a significantly lower incidence of diabetes than the control group, thereby allowing researchers to conclude that interventions aimed at lifestyle changes may lead to decreases in the incidence of diabetes.

Similarly, the Finnish Diabetes Prevention Study was employed to determine the feasibility and effectiveness of lifestyle modification in a high-risk population (Tuomilehto et al., 2001). Overweight subjects (n=522) with impaired glucose tolerance were randomly assigned to a control group or intervention group, aimed at reducing weight, maintaining a proper diet and increasing physical activity. At the 2 year follow-up, the cumulative incidence of diabetes was significantly lower in the intervention than control group, 11% and 23% respectively. Moreover, there was a strong inverse relationship between success score (score achieved by reaching goals of intervention, i.e. weight loss, physical activity) and incidence of diabetes.

Finally, the Diabetes Prevention Program (DPP) randomly assigned 3234 high risk adults into three groups (standard lifestyle recommendations (SLR) plus metformin, SLR plus placebo, or intensive lifestyle modification) (Knowler et al., 2002). The intensive lifestyle modification group followed a supervised program aimed at achieving ≥7% weight loss through a low-calorie, low-fat diet and moderate intensity physical activity for ≥150 min/week. Upon follow-up, significant decreases in daily energy intake and average fat intake, along with increases in weight loss and leisure-time physical activity were noted in the intensive lifestyle group, when compared to both the metformin and placebo groups ($p < 0.001$). Further, the incidence of diabetes for placebo, metformin and lifestyle groups was 11, 7.8 and 4.8 cases/100, respectively. Overall, results from DPP and the Finnish Diabetes Prevention Study demonstrated a 58% relative risk reduction with lifestyle interventions when compared to placebo or usual care.

The three large randomized control trials discussed above offer a "high risk approach", focusing exclusively on those at the highest risk for developing type 2 diabetes (Satterfield et al., 2003). In comparison, "population or public health approaches", which attempt to reduce risk factors within communities, offer smaller benefits to each individual but greater potential benefits for the larger population (Satterfield et al., 2003). To date, community-based interventions for diabetes prevention have been met with moderate success.

The Stockholm Diabetes Prevention Program (SDPP) focused on three major risk factors for the development of type 2 diabetes: physical inactivity, poor diet and obesity (Bjaras, Harberg, Sydhoff, & Ostenson, 2001). With regard to the physical activity component, walking was used as part of community members' daily routines. Volunteer leaders were recruited through the local media to lead neighbourhood walking groups. Upon completion, it was concluded that locally recruited leaders were easy to involve and more importantly, one-third of participants had never exercised regularly prior to the campaign.

Specific to Canada, the Kahnawake Schools Diabetes Prevention Project was a three-year community-based primary prevention program in a Mohawk community in Quebec (Maccauley et al., 1997). The project was rooted in behaviour change theory, the Ottawa Charter of Health Promotion, and Native Leaning styles, with primary objectives to improve healthy eating and physical activity among elementary school children. Repeat cross-sectional results from 1994 to 2002 showed favourable physical activity and fitness trends, but were not maintained in 2002 (Paradis et al., 2005). Further, increases in skinfold thickness and BMI were revealed, therefore leading researchers to conclude that early benefits for reducing risk factors among this community were not sustained over 8 years.

Many of these community-based prevention programs rely on community strengths and utilize participation and collaboration with community members and leaders (Satterfield et al., 2003). Notwithstanding, many of the community-based interventions do not target and/or report clinical markers or the prevalence of diabetes, thus making it hard to draw conclusions about the effectiveness of these interventions for the prevention of type 2 diabetes (Satterfield et al., 2003).

2.3.2 Diabetes Management

In addition to prevention, studies aimed at lifestyle modification for effective diabetes *management* have also demonstrated positive results. Hanefeld and colleagues'

(1991) conducted a 5-year multi-intervention trial to test the efficacy of an intense health education program (IHEP) on metabolic control, reduction of coronary risk factors and incidence of heart disease. Participants with type 2 diabetes were randomized into IHEP plus clofibric, IHEP plus placebo, and a control group, with the IHEP consisting of dietary advice, anti-smoking, anti-alcohol and physical activity enhancement. Follow-up revealed that IHEP resulted in improved glucose control and significantly diminished the need for antidiabetic drugs for the treatment group.

In a study by Schneider, Khachadurian, Amorosa, Clemow, and Ruderman (1992), 255 patients with diabetes (78% with type 2) enrolled in a lifestyle modification program. These patients were compared to 58 sedentary controls in order to examine the effects of diet and exercise on metabolic parameters and safety. Upon a 3 month follow-up, modest decreases in BMI and body weight, along with significant decreases in mean fasting glucose and hemoglobin were found in the lifestyle modification group.

Not only have clinical trials demonstrated success, but community-based interventions also show promise. Health, Leonard, Wilson, Kendrick, and Powell (1987) reported results from a community-based exercise program designed to help community members with type 2 diabetes better control their condition. Retrospective evaluation compared medical records of 30 participants with 56 non-participants, matched on demographic characteristics. Results revealed that a significant difference in mean weight loss and fasting blood glucose levels were shown between participants and non-participants over a two-year period ($p<0.05$).

Conclusions from these studies therefore suggest that lifestyle modification may prevent one's risk of developing diabetes, and may lead to an improvement in metabolic control and CHD risk factors for those who already have diabetes. Nevertheless, many lifestyle intervention studies do not report change in physical activity behaviour as an outcome. Of those intervention studies that do report outcomes for physical activity behaviour change, results have been variable. Hanefeld and colleagues' (1991) study for example, revealed that participants in both intervention groups reported a significant increase in physical activity when compared to controls at 5-month follow-up ($p<0.01$). Other studies, however, report no significant changes in physical activity levels between treatment groups and controls upon follow-up (Agurs-Collins, Kumanyika, Ten Have, & Adams-Campbell, 1997; Vanninen, Uusitupa, Siitonen, Laitinen, & Lansimies, 1992; Uusitupa, 1996).

A possible explanation for the mixed success rates in physical activity behaviour change may be that many of these interventions implement atheoretical approaches and do not include cognitive behavioural strategies. Further, some of these interventions are not tailored to social, cultural and personal characteristics of their target populations. This realization has lead many organizations such as the American College of Sports Medicine (ACSM) to recommend the utilization of theoretical models to guide intervention design and implementation (Albright et al., 2000).

2.4 Physical Activity

2.4.1 Benefits of physical activity for diabetes management

Physical activity, which includes both aerobic and resistance exercises, is now well-recognized as one of the cornerstones for effective management of type 2 diabetes (CDA, 2003; Sigal, Kenny, Wasserman, & Castaneda-Sceppa, 2004). Aerobic exercise is defined as "rhythmic, repeated and continuous movements of the same large muscle group for at least 10 minutes at a time" (CDA, 2003, p. S24). Several studies have shown that aerobic activity can help improve glycemic control and decrease insulin resistance (ADA & NIDDKD, 2002; Boule, Kenny, Haddad, Wells, & Sigal, 2003; CDA, 2003). Moreover, aerobic activity can help decrease cardiovascular disease risk factors by lowering triglyceride levels and blood pressure, and improving HDL cholesterol and weight control (CDA, 2003; Ford & Herman, 1995; Tsui & Zinman, 1995). These benefits have been observed independent of age, gender or body mass index (Plotnikoff, Brez, & Hotz, 2000).

Resistance exercise is defined as "activities that use muscular strength to move a weight or work against a resistant load" (CDA, 2003, p. S24). Resistance training is has been shown to improve bone density, muscle mass, strength and balance, all of which are important for decreasing risk of osteoporosis and maintaining functional independence for older adults with diabetes (Sigal et al., 2004). Specifically for those with type 2 diabetes, clinical trials have demonstrated that resistance training can improve glycemic and metabolic control (Castaneda et al., 2002; Dunstan et al., 2002), and decrease cardiovascular risk factors through the improvement of lipid profiles, body composition and blood pressure (Castenada et al., 2002).

In addition to the numerous physiological benefits, regular participation in physical activity may be beneficial for one's mental health. Physical activity has been shown to improve mood, self-esteem, and symptoms of depression and anxiety (Ford & Herman, 1995; Marcus et al., 2000). This is especially important as it has been reported that depression is more prevalent among people with diabetes when compared to the general population (Ford & Herman, 1995; Haire-Joshu, Heady, Thomas, Schechtman, & Fisher Jr., 1994).

Further, physical activity may help improve overall quality of life among people with diabetes (Glasgow, Ruggiero, Eakin, Dryfoos, & Chobanian, 1997). In a study by Glasgow et al. (1997), the association between self-management characteristics and quality of life was examined. After controlling for demographic and medical variables, self-report level of exercise was the only significant self-management behaviour to predict quality of life. Consequently, for people with diabetes, physical activity should be stressed as an important part of the self-care regimen, both for its physiological and psychological benefits.

2.4.2 Physical Activity Recommendations

The American College of Sports Medicine (ACSM) and the Centers for Disease Control (CDC) have put forth a joint position statement advising that individuals should accumulate at least 30 minutes or more of moderate intensity activities over most days of the week (Pate et al., 1995). For adults with diabetes, the ACSM recommends that they engage in at least three nonconsecutive days and up to five physical activity sessions per week, for a minimum of 30 minutes per session at a low-to-moderate intensity (40-70% VO2 max), to achieve cardiorespiratory endurance and metabolic improvements (Albright et al., 2000).

The CDA (2003) employs similar guidelines, recommending that people with type 2 diabetes accumulate at least 150 minutes of moderate-intensity aerobic activity, spread over 3 nonconsecutive days of the week. If possible, the CDA encourages adults to participate in four hours or more of physical activity per week. It is also recommended that people with diabetes engage in resistance training activities, such as weight lifting, 3 times per week (CDA, 2003; Sigal et al., 2004).

These new guidelines for moderate activity are a change from older prescriptions of more vigorous activity to achieve health benefits. The promotion of moderate forms of activity are a result of recent findings suggesting that moderate activity, such as brisk walking, can lead to equivalent health benefits to those seen at a higher intensity (Albright et al., 2000; Pate et al., 1995). In fact, research has demonstrated that walking in combination with diet is effective for weight loss and numerous other health outcomes (Brill, Perry, Parker, Robinson, & Burnett, 2002). Specifically for people with diabetes, walking for at least 2 hours a week was associated with 34-39% reduction in all cause and CVD mortality (Gregg, Gerzoff, Caspersen, Williamson, & Narayan, 2003).

Further, a shift has occurred within the public health domain to promote lifestyle physical activity (Brownson et al., 2000; Pate et al., 1995). *Lifestyle physical activity* is a "self-selected activity that is associated with leisure, occupation, household or child caring that can be a planned or unplanned activity that is part of everyday life." (Dunn, Anderson, & Jakicic, 1998, p. 398). This contrasts *leisure-time physical activity*, which by definition is performed during exercise, recreation, or any additional time other than that associated with one's regular job duties, occupation or transportation (Statistics Canada, 2004). Lifestyle activity therefore encompasses a broader definition of physical activity, and has been shown to be just as effective for producing beneficial changes in levels of physical activity, cardiorespiratory fitness, blood pressure and body composition as traditional structured approaches (Dunn et al., 1999).

2.4.3 Physical Activity Prevalence

Despite the potential benefits of regular physical activity, 51% of Canadians from the general population aged 20+ years fail to participate in adequate amounts of physical activity (Canadian Fitness and Lifestyle Research Institute (CFLRI), 2004). Further, 65.1% of Canadians with self-report diabetes are inadequately active (Health Canada, 2002). These rates of inactivity may be even higher among certain population sub-groups, such as women, older adults, those with lower levels of education and income, those with disabilities, and ethnic or racial minorities (Jones et al., 1998; Wen et al., 2002).

Health practitioners continue to explore determinants of physical activity and the utility of various behaviour change theories in order to develop salient strategies to enhance physical activity participation. Given that there is a limited amount of published literature examining the determinants of physical activity behaviour for people with diabetes, the literature surrounding determinants of physical activity for the general population will also be reviewed.

2.5 Determinants of Physical Activity

2.5.1 General Population

The literature suggests that certain socio-demographic characteristics, health factors and psychosocial variables are correlated with physical activity participation. Physical activity is consistently associated with age, gender, ethnicity, and SES among adults of the general population (Eyler, 2003; King et al., 1992, Trost, Owen, Bauman, Sallis, & Brown, 2002). Moreover, health factors such as BMI, smoking, dietary habits and disability have all demonstrated an association with leisure-time physical activity participation (Trost et al., 2002).

With regard to psychosocial variables, the literature is vast and continually evolving. Thus far, psychosocial variables that have shown to be related to physical activity behaviour include knowledge, attitudes, perceived benefits and barriers, value of physical activity outcome, intentions, perceived behavioural control, normative beliefs, self-efficacy and self-motivation (Eyler, 2003; King et al., 1992; Trost et al., 2002).

2.5.2 Canadian Data

A vast amount of the literature regarding demographic determinants of physical activity is derived from the United States. Research surrounding trends in physical activity show that the demographic determinants from the US and other industrialized nations are consistent with Canadian data. Craig, Russell, Cameron, and Bauman (2004) collected twenty-year trends from 1981 to 2000 of physical activity from six national surveys and found that gender (male) and age (younger) were significantly associated with being more active. Educational differences, although still significant, narrowed between 1981 and 2000, perhaps due to increases in graduation rates among secondary schools and colleges. Notwithstanding, in 1981 Craig et al. found that there were no income gradients in physical activity, yet in 2000 those with higher incomes were significantly more likely to be active than those with lower incomes.

Plotnikoff, Mayhew, Birkett, Loucaides, and Fodor (2004) recently published a large randomized study of over 20,000 Canadians, stratified by age, gender and geographic location. Their findings reported that proportion of friends who exercise, injury from past physical activity, education level, perceived health status and alcohol consumption demonstrated the strongest associations across subgroups. An interesting finding, however, revealed that education was negatively correlated with physical activity among the two younger age groups (18-25, 26-45 years). They interpreted this finding by suggesting that health benefits of physical activity are now widely available via mass media (i.e. internet), something that was not possible for older generations.

2.5.3 Gender

The majority of literature suggests that women have lower rates of participation than men in both moderate and vigorous physical activity (King et al., 1992; Marcus, Dubbert, King, & Pinto, 1995; Sherwood & Jeffery, 2000; Trost et al., 2002). Canadian statistics also confirm this finding, as the most recent National Population Health Survey revealed that Canadian women were more inactive than men (59% vs. 53%) (CFLRI, 2002).

Nevertheless, initial physical activity questionnaires were designed for men and have often failed to account for other forms of physical activity that reflect women's lives (e.g., household, childcare activity, light-moderate activity) (Ainsworth, Richardson, Jacobs, & Leon, 1993; Marcus et al., 1995). Consequently, when these types of activities have been included in the definition of physical activity, gender-related differences in rates of participation tend to disappear (Ainsworth et al., 1993; King et al., 1992; Marcus et al., 1995).

2.5.4 SES

Socioeconomic status (SES), which can be defined by income, educational attainment and/or occupational status, is an important determinant of physical activity behaviour. Several studies have demonstrated that education and income are positively associated with physical activity (Crespo, Smit, Carter-Pokras, & Anderson, 2000; King et al., 1992), yet the relationship between occupation and physical activity is less clear (Eyler, 2003; King et al., 1992).

Results from the US Behavioural Risk Factor Surveillance Survey indicated that self-report leisure-time activity was positively associated with higher levels of education (Cauley, Donfield, LaPorte, & Warhaftig, 1991). In addition, the Stanford Five-city Project reported that moderate and vigorous activities were the greatest in men and women of the highest education category (Cauley et al., 1990). Giles-Corti and Donovan (2002) report that this trend appears to be true even after adjusting for other socio-demographic factors, as they revealed that those living in low SES areas were 26% less likely to do sufficient activity when compared to residents of high SES areas.

Canadian statistics appear to parallel that of the United States. According to the National Population Health Survey, 67% of those with less than secondary education were inactive compared to 52% of people with a post-secondary education (CFRI, 2002). Additionally, 63% of people with an income of $20,000 of below were inactive compared to 47% of people with an income of $80,000 or above (CFRI, 2002).

The relationship between SES and physical activity by gender, however, appears to be more complicated. In a review by Eyler (2003), it is reported that the relationship between SES and physical activity has been shown to be true across gender, however, it may predict differently for activity type. Sternfeld, Ainsworth, and Queensberry (1999) report parallel findings, suggesting that education was positively related to sports/exercise and leisure-time physical activity, but negatively associated with household and care-giving activity, for women.

Cauley et al. (1991) indicate similar trends, stating that the relationship between physical activity and SES differs between genders based on the type of activity assessed. For example, SES was a significant predictor for walking only among females, with low SES women reporting more walking. Further, the relationship between SES and light and moderate activity was only significant for males, as the number of hours per week spent in light activities was lower and number of hours per week spent in moderate activity was greater, among low SES men.

Ford and colleagues' (1991) study revealed other interesting trends. Number of minutes in total physical activity for example, were significantly greater among high SES women than low SES women ($p<0.0001$). There was no statistically significant difference between SES groups in men. Additionally, high SES women spent significantly more time per week in leisure-time physical activity ($p<0.0001$), however contrary to other findings, high SES women also spent significantly more time in job-related and household activity than did low SES women ($p<0.05$). For men the reverse was reported, as low SES men spent significantly more time per week walking and doing household chores than high SES men ($p<0.05$).

2.5.5 Gender and SES Differences in Psychosocial Determinants

In recent years, the literature in the physical activity domain has largely focused on understanding psychosocial determinants of physical activity. Notwithstanding, social and cultural contexts in which people live may produce different attitudes, beliefs, perceptions, values and expectations regarding physical activity behaviour (Clark, 1995).

These social and cultural contexts must therefore be taken into account, as they may act as moderators of the behaviour. Consequently, when reviewing psychosocial determinants it is important to examine differences between demographic groups, namely between men and women and those of low and high SES.

Perceived benefits of physical activity have been highly studied because they often shape the individual's attitude towards physical activity, ultimately affecting their motivation. The literature suggests that perceived benefits of physical activity do differ by gender. Women, for example, are more likely to report that social factors and release of tension are the major benefits for engaging in physical activity (Sherwood & Jeffery, 2000). Conversely, men are more likely to report fitness and health benefits of participating in physical activity (Sherwood & Jeffery, 2000).

Additionally, perceived benefits of physical activity may differ by SES. Burton, Turrell, and Oldenburg's (2003) qualitative study explored how influences on recreational physical activity (RPA) differed by SES position (high, medium and low). In their findings, "physical health" was identified as a benefit of RPA equally across all three SES groups. High SES participants, however, were more likely to identify "social benefits" and a "balanced lifestyle" as expected benefits of RPA. Moreover, "emotional benefits" (i.e., stress management) was more salient among high and medium SES groups.

In terms of perceived barriers, the literature reports that lack of knowledge, time, interest, enjoyment, and skill or ability are commonly reported barriers (Marcus et al., 1995; Salmon, Crawford, Owen, Bauman, & Sallis, 2003; Trost et al., 2002). Cost, feeling tired, work and family commitments, disability or injury, and social anxiety have also been reported as perceived barriers to physical activity (Marcus et al., 1995; Salmon et al., 2003; Trost et al., 2002). Overall, women more frequently report a perceived barrier to physical activity than men (Booth, Bauman, Owen, & Gore, 1997; Sternfeld et al., 1999). A possible explanation for this trend is that women are more likely to have greater domestic responsibilities in combination with employment outside the home (Johnson, Corrigan, Dubbert, & Gramling, 1990), and may often feel that they should put their families needs before their own (Cody & Lee, 1999). In fact, women often report lack of time due to family obligations as a barrier for physical activity participation (Johnson et al., 1990; Verhoef & Love, 1994).

Barriers to physical activity may also vary across SES. Brownson, Baker, Housemann, Brennan, and Bacak's (2001) study examined perceived environmental determinants of physical activity across gender and income. Their results revealed that lack of energy and not being in good health were the barriers that demonstrated the strongest associations with physical activity, for women and men respectively. Across income groups, six personal barriers were inversely related to physical activity among high income respondents, whereas only one personal barrier (not being in good health) was inversely related in low income respondents. Other studies may argue, however, that individuals of lower SES report more barriers to physical activity than those of higher SES because of limited resources and access to facilities (Burton et al., 2003).

Self-efficacy, defined as confidence in one's ability to be physically active under a variety of situations, has also been found to be significantly associated and predictive of physical activity behaviour (Oman & King, 1998; Sallis, Hovell, Hofstetter, & Barrington, 1992). This positive relationship has been found to be true for both male and females adults (Oman & King, 1998; Wallace, Buckworth, Kirby, & Sherman, 2000). Some studies, however, report gender differences and results suggest that men have a stronger sense of self-efficacy than women (McAuley, Courneya, & Lettunich, 1991; Netz & Raviv, 2004). Other studies suggest that self-efficacy may predict differently across gender based upon activity status (Sallis et al., 1992). In Sallis and colleagues' (1992) randomly selected sample, self-efficacy predicted adoption of vigorous physical activity for both sedentary men and women. Maintenance of vigorous physical activity, however, was predicted by self-efficacy only for active men.

Studies also suggest that a relationship exists between physical activity self-efficacy and SES (Clark, 1996; Grembowski et al., 1993). Clark and Notwehr's (1999) study of self-efficacy among older adults reported males with an income of more than $1,000 per month had significantly higher exercise self-efficacy scores. Further, Burton and colleagues' (2003) qualitative study reported that cognitive influences, in particular efficacy to include physical activity within their lifestyle, was more salient among mid and high SES groups.

The relationship between self-efficacy and SES may be partially explained by the suggestion that self-efficacy is a product of life experiences and successes (Bandura, 1986; Clark, 1995). For example, those with higher levels of education or income have most likely experienced greater socially recognized success, thus affecting their confidence to engage in certain behaviours such as physical activity (Clark, 1995). Moreover, increased levels of education and income may affect one's knowledge regarding the benefits of physical activity, and resources to carry out the behaviour, ultimately influencing situation-specific self-efficacy (Clark, 1995; Grembowski et al., 1993)

Social support is another important determinant of physical activity behaviour (Booth, Owen, Bauman, Clavisi, & Leslie, 2000; Eyler, 2003; King, Taylor, Haskell, & DeBusk, 1990). For example, Plotnikoff and colleagues' (2004) study of over 20,000 Canadians reported that 'proportion of friends who exercise' had the highest positive relationship with physical activity behaviour. Several other studies also suggest that social support is associated with physical activity for both men and women, however, the source of support may differ between genders (Booth et al., 1997; Oka, King, & Young, 1995; Wallace et al., 2000).

Wallace and colleagues' (2000) for example, indicated that social support from family was a significant predictor of exercise behaviour among females, whereas friend social support was predictive among males. Booth and colleagues' (1997) study of insufficiently active Australians also demonstrated gender differences in preferred sources of social support, results indicated that women placed more importance on exercising with a group, while men placed greater importance on professional advice.

Much like self-efficacy, however, the relationship between social support and physical activity may differ across gender based on activity status (Litt, Kleppinger, & Judge, 2002; Troped & Saunders, 1998). Troped and Saunders (1998) examined gender differences in social influence and found that overall, women had greater perceived expectations from others to be active and had greater motivation to comply with others. Nevertheless, when women were compared to men by stage of exercise (inactive, adoption, maintenance), differences between groups were greatest at earlier stages of exercise.

The role of social support in physical activity behaviour between varying SES groups remains less clear. Burton and colleagues' (2003) found that social influences were more prevalent in mid and high SES groups, as they were more likely to describe encouragement and companionship for recreational physical activity. In their study of geographically and economically diverse groups, Parks, Housemann, and Brownson (2003) found that receiving social support increased the likelihood of meeting physical activity recommendations. Notwithstanding, receiving support from friends was significantly associated with physical activity for low-income urban, low-income suburban and high-income rural residents, whereas support from relatives was only significant for high-income suburban residents.

Finally, a recent focus in the literature is the role of environmental factors in physical activity participation. Physical environmental factors influencing physical activity may be real or perceived. Examples of real (objective) physical environmental factors include spatial access to recreational facilities, programs, walking/jogging trails, parks, and the weather (Brownson et al., 2001; Giles-Corti & Donovan, 2002). Perceived environmental factors may include perceptions of the neighbourhood environment (i.e., attractiveness, safety, traffic and traffic hazards) and perceptions of access to neighbourhood services (i.e., availability of sidewalks, street lighting) (Brownson et al., 2001; Giles-Corti & Donovan, 2002).

Across gender and SES, environmental factors may demonstrate differential effects. According to Brownson and colleagues' (2001), both men and women with lower incomes were more than 20% as likely as those with higher incomes to report that heavy traffic affected physical activity participation. With regard to environmental-behaviour correlations, access to parks and facilities, and perceived neighbourhood environment (i.e. sidewalks, enjoyable scenery etc.) were more highly correlated with physical activity among women than men. Across income groups, enjoyable scenery for lower income individuals and the presence of sidewalks for higher income individuals exhibited the strongest associations with physical activity.

Similarly, other research examining the role of environmental factors across SES groups demonstrate mixed results. In their Scottish study, Macintyre, Maciver, & Sooman (1993) reported an inequitable distribution of recreational facilities in favour of persons living in high SES suburbs. Conversely, in the United States Giles-Corti and Donovan (2002) revealed that the odds of being in the top quartile of access to facilities was significantly higher among those with low income. Despite greater access facilities, these individuals were less likely to perceive that their neighbourhood was attractive, interesting, safe and supportive for walking.

2.5.6. Diabetic Population

Although it is now well-recognized that physical activity is a key behavioural strategy for the management of type 2 diabetes, a gap remains in the literature surrounding key socio-demographic and psychosocial variables associated with physical activity participation among this population. With regard to demographic determinants, correlation studies have revealed that physical activity among people with type 2 diabetes has been significantly associated with a younger age (Hays & Clark, 1999; Nelson, Reiber, & Boyko, 2002), male gender (Plotnikoff et al., under revision; Notwehr &

Stump, 2000; Nelson et al., 2002), white ethnicity (Nelson et al., 2002), higher education (Hays & Clark, 1999; Plotnikoff et al., under revision), and higher income (Plotnikoff et al., under revision). Notwithstanding, research studies examining demographic factors are limited and inconsistent, and therefore more research is needed so that interventions can target high-risk groups.

The literature examining psychosocial determinants among this population is also scarce. Several studies have examined psychological variables in diabetes self-care behaviours, however, many of these studies have shortcomings (Glasgow et al., 1989). First, many studies fail to differentiate between self-care behaviours or identify physical activity behaviour as a primary outcome (Plotnikoff, Brez, & Hotz, 2000). Second, numerous studies fail to differentiate between type of diabetes in their sample. This is problematic since it is suggested that people with type 1 and type 2 diabetes experience the disease differently, and thus may exhibit diverse attitudes and beliefs toward physical activity.

Nevertheless, a handful of studies do exist that have examined psychosocial determinants of physical activity behaviour specifically among people with type 2 diabetes. Swift, Armstrong, Beerman, Campbell, and Pond-Smith (1995) investigated attitudes and beliefs about exercise and reported the main reasons for initiating and continuing exercise were diabetes control, weight loss/weight management, stress relief, enjoyment and health/fitness. In terms of perceived barriers, several studies have demonstrated an inverse relationship between barriers and exercise adherence (Aljasem, Peyrot, Wissow, & Rubin, 2001; Pham, Fortin, & Thibaudeau, 1996; Wilson et al., 1986). The most commonly cited perceived barriers and related beliefs among this population included lack of time, convenience, motivation and others with whom to exercise, along with pain/discomfort, fear of complications, physical limitations, and exercise not being seen as a priority (Schultz, Sprague, Branen, & Lambeth, 2001; Swift et al., 1995, Wanko et al., 2004). Further, Hays and Clark (1999), examined knowledge, perceived barriers and expectations and reported that fewer motivational barriers, and greater perceived health and performance expectations, were correlated with weekly physical activity.

As shown within the general population, research has demonstrated that exercise is correlated with self-efficacy (Kingery & Glasgow, 1989; Ludlow & Gein, 1995; Padgett, 1991; Skelly, Marshall, Haughey, Davis, & Dunford, 1995), outcome expectations (Kingery & Glasgow, 1989) and outcome expectancies (Skelly et al., 1995) among people with type 2 diabetes. Further, self-efficacy has predicted exercise at 1 and 4 months (Skelly et al., 1995) and 6 months (Kingery & Glasgow, 1989). A significant positive relationship between social support and exercise adherence among people with type 2 diabetes has also been demonstrated (Pham et al., 1996; Wilson et al., 1986). Consequently, it appears that psychosocial determinants of physical activity among people with diabetes do not differ greatly from those in the general population.

Notwithstanding, studies have compared whether social-cognitive factors and physical activity patterns differed among people with and without diabetes (Plotnikoff et al., 2003), and whether they differed based upon stage of change (Plotnikoff et al., 2000). Findings suggest that some social-cognitive factors associated with physical activity (i.e., self-efficacy, perceived behavioural control, pros and cons of exercise, self-concept, social and environmental support), do differ for people with diabetes: i) when compared to those within the general population, and ii) when in different stages of behaviour change. However, the sample sizes in these studies were small, thus caution is warranted in interpreting the results.

Studies examining gender and SES differences in psychosocial determinants of physical activity among people with type 2 diabetes are notably absent. Hays and Clark (1999) examined correlates of physical activity among people with type 2 diabetes and reported that performance expectation (performance confidence) scores were significantly lower among women than men, however gender differences in knowledge, barriers and outcome expectations did not exist. Fitzgerald, Anderson, and Davis (1995) examined gender differences in attitudes and adherence with self-care behaviours, including physical activity behaviour. Using the Revised Diabetes Attitude Scale, it was shown that men and women with type 2 diabetes differ significantly on patient compliance, as men were more likely to report adherence to exercise ($p<0.01$). Moreover, significant gender differences concerning physician's advice about exercise were reported; as more men reported being told to exercise than women (95% vs. 88%, $p<0.01$). Wanko and colleagues' (2004) examined barriers to exercise among urban African Americans with type 2 diabetes. Comparisons across demographic factors revealed that an older age and having a college education increased the odds of reporting a barrier to exercise. Conversely, being male was associated with lower odds of reporting an exercise barrier.

To date, there are no known studies that have examined gender and/or SES differences in other psychosocial determinants of physical activity behaviour among people with type 2 diabetes. Consequently, these potential differences need to be studied so that theoretically-driven interventions can be targeted and tailored to meet the specific needs of these demographic sub-groups.

2.6 Preferences for Physical Activity

2.6.1 General Population

There are several factors that may influence adoption and maintenance of physical activity including age, gender, income, education, attitudes, beliefs, perceived barriers, self-efficacy, social support and environmental characteristics. However, one factor frequently overlooked when designing and implementing physical activity interventions is personal preferences regarding various features of the intervention (Sepsis et al. 1995; Wilcox, King, Brassington, & Ahn, 1999). These personal preferences may include the type, intensity and format of activity, mode of delivery, time of day, informational needs and social aspects.

With regard to the type of activity, walking is commonly reported as the most preferred activity by adults (Booth et al., 1997; Eyler, Brownson, Bacak, & Houseman, 2003). Activities that are of moderate-intensity are also commonly preferred over vigorous-type activities; a finding that is particularly relevant as moderate activity can promote health benefits similar to those from high intensity (King, Haskell, Taylor, Kraemer, & DeBusk, 1991; Pate et al., 1995). Nevertheless, the literature suggests that gender and SES differences exist in other activity preferences.

Walking and aerobics, for example, are consistently reported as the most common forms of activity by women (Booth et al., 1997; Sherwood & Jeffery, 2000). Alternatively, gardening/yard work, strengthening exercises, jogging/running and contact sports are most commonly reported activities among men (Booth et al., 1997; Sherwood & Jeffery, 2000). Similarly, differences in preferred activity type and intensity have been found based on SES status, however, the association between activity and SES may differ depending on the dimension of activity (Cauley et al., 1991; Ford et al., 1991). Cauley and colleagues' (1991) reported that sport activities were more commonly reported by males and females of high SES, yet no differences were reported between SES groups for "sweating activities". Further, there were no differences found in light or moderate activity for females by SES, while males of low SES reported more moderate activity and fewer lighter activities than high SES males.

Program format is another important preference that has gained attention for designing and implementing physical activity interventions. Interestingly, most studies report that activities that can be done on their own at home are more appealing than those performed in a group or a class (King et al., 1990; Wilcox et al., 1999). This is a finding that is consistent across genders (Wilcox et al., 1999) and among different clinical populations (Jones & Courneya, 2002). King and colleagues' (1991) study for example, investigated the effectiveness and adherence to group versus home-based exercise training among a community sample. The 12-month follow-up activity log results revealed adherence rates were better among home-based participants relative to group-based. Results of other studies also suggested that home-based programs may increase convenience, flexibility and general appeal of physical activity programs (Perri, Martin, Leermakers, Sears, & Notelovitz, 1997). Home-based programs may also increase potential for adherence because they minimize any negative transfer effects from group programs to one's natural environment (Perri et al., 1997).

Often in combination with program format, mode of delivery is another personal preference that may affect adherence and success. Typical mode of delivery techniques include print self-help material, telephone counseling, face-to-face counseling and more recently, internet websites (Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998). Lombard, Lombard, and Winett (1995) demonstrated that telephone prompting, either as "touching base" or highly structured feedback, is effective for increasing physical activity behaviour. Other studies suggest that that interactive internet websites can have a short-term impact on physical activity motivation and behaviour, and are beneficial because they are available 24 hours, thus allowing for greater flexibility (McKay, King, Eakin, Seeley, & Glasgow, 2001; Napolitano et al., 2003). Few studies have examined gender and SES preferences for mode of delivery.

Other program features, such as distance from home, transportation, scheduling, cost, personal control and interaction with others have been shown to influence participation (Moore & Kramer, 1996; Sepsis et al., 1995). Sepsis and colleagues' (1995) examined ratings of various program support mechanisms among older adults and found that introductory meetings, along with attention and telephone contact from staff were some of the most important support mechanisms to increase physical activity.

Moore and Kramer's (1996) study on cardiac rehabilitation preferences demonstrated that "discussing progress" and "encouragement from professionals" were the most important features of the rehabilitation program for both men and women. The only gender difference was women reported "not getting tired while exercising" as more important than men. The study also examined the extent to which preferences were not being met and revealed that for men, the least met preference was the ability "to set own goals", whereas for women the least met preference was "ability to choose own exercise". Consequently, the literature suggests that people should be involved in decisions regarding the type, intensity and format of the activity, in order to preserve interest and ultimately promote long-term maintenance.

2.6.2 Diabetic Population

Among people with type 2 diabetes, preferences for physical activity programs have not been studied extensively. However, several studies have examined the types of activities in which people with type 2 diabetes participate and they appear to be quite similar to the general population. Walking, once again, rated as the most popular form of leisure-time physical activity (Krug, Haire-Joshu, & Heady, 1991; Plotnikoff, in press; Wanko et al., 2004), with more women than men indicating walking as their preferred activity (Wanko et al., 2004). Other commonly reported leisure-time activities include cycling, swimming and gardening/yard work (Krug et al., 1991; Wanko et al., 2004).

Unfortunately, no known studies have examined preferences for program format and features among this population. Further investigation, specifically among population subgroups, is therefore needed so that relevant and appealing programs may be offered, rather than a "one-size-fits all" approach.

2.7 Physical Activity and Behaviour Change Theory

2.7.1 General Population

To promote physical activity at the individual level, practitioners attempt to understand the individual behaviour change process. Several social-cognitive theories and models have been put forth to identify important factors involved in human behaviour. Within the physical activity domain, the theories most commonly employed include the Health Belief Model, Theory of Planned Behaviour, Transtheoretical Model, and Social Cognitive Theory.

The Health Belief Model (HBM) proposes that a person will adopt a behaviour for the prevention or control of some disease based upon the perception of a threat to their personal health (Godin & Shephard, 1990). When applied to physical activity behaviour, the HBM postulates that a person will adopt or change their physical activity based upon: i) their perceived susceptibility to a health threat cause by physical inactivity; ii) the perceived severity of its impact on their health; iii) their beliefs about the benefits of adopting the physical activity behaviour; and, iv) the extent to which the benefits outweigh the costs (Marcus King, Clark, Pinto, & Bock, 1996). The utility of the HBM within the physical activity domain has produced modest results. For example, Oldridge and Steiner (1990) examined HBM's predictive ability for physical activity among coronary heart disease patients and reported that HBM explained 5.2% of the variance.

The Theory of Planned Behaviour (TPB) is an extension of the Theory of Reasoned Action and proposes that an individual's intention to perform a behaviour will predict whether the behaviour is actually undertaken (Ajzen, 1991). Intention to engage in a behaviour consists of the individual's attitude (benefits and costs) and social factors (subjective norm) (Azjen, 1991). Further, the TPB includes the construct of perceived behavioural control, which like self-efficacy, suggests that "an individual's perception of their ability to engage in behaviour will vary across situation, and is influenced by resources, opportunities and skills" (Marcus et al., 1996, p. 327). Godin (1994) reviewed several studies based upon the TPB to examine the relationship between intention and exercise behaviour. Godin demonstrated that intention has a .55 correlation with behaviour and accounted for 30% for the variance in exercise behaviour.

The Transtheoretical Model (TTM) examines an individual's current behavioural status and classifies them within five stages of readiness for change (Prochaska & DiClemente, 1983). Additionally, the TTM incorporates self-efficacy, a decisional balance scale (pros and cons), and cognitive and behavioural processes that individuals' use as strategies when modifying behaviour (Prochaska & DiClemente, 1983). Interventions based upon the TTM have shown success for physical activity behaviour change. Marcus and colleagues' (1992), for example, examined the effects of a 6-week physical activity intervention based upon the TTM and concluded that stage-based community interventions resulted in movement toward the action stage.

Finally, the Social Cognitive Theory (SCT) is one of the most prominent theories in the field, used to explain and predict physical activity behaviour change. SCT proposes that individuals are both agents and recipients of their behaviour, and is based on the belief that human behaviour is triadic and dynamic (Bandura, 1986). This idea of "reciprocal determinism" therefore suggests that personal, behavioural and environmental factors interact bi-directionally, ultimately determining behaviour (Bandura, 1986; Baranowski, Perry, & Parcel, 2002; Dzewaltowski, 1994). Social Cognitive Theory constructs are explained in greater depth in Section 2.8.

Within the general population, intervention studies have demonstrated that SCT constructs, such as self-efficacy, outcome expectations, outcome expectancies, self-control and social support can be effectively operationalized to enhance physical activity among adults (Marcus et al., 1996). Hallam and Petosa (2004) for example, examined the long term effect of a four-session worksite intervention on selected SCT variables related to physical activity behaviour. Significant increases were seen in self-regulation and outcome expectancy values, and maintenance of physical activity behaviour at 12 months for the treatment group. It was therefore concluded that the intervention produced the intended changes in SCT constructs, and self-regulation mediated physical activity behaviour. Hence, the Social Cognitive Theory appears to offer great promise for understanding behaviour and designing interventions for physical activity.

2.7.2 Diabetic Population

Theory-based physical activity interventions for people with type 2 diabetes have been limited thus far. Of those interventions that have targeted physical activity behaviour change, the Transtheoretical Model (TTM) and Social-Cognitive Theory (SCT) have served as guiding frameworks.

Kirk, Mutrie, MacIntyre, and Fisher (2003) randomly assigned people with type 2 diabetes to a control or intervention group to test the efficacy of exercise consultation. The control group received a standard exercise leaflet and two follow-up phone calls. The treatment group received a stage-matched leaflet, two follow-up phone calls and an individualized 30 minute counseling session which investigated benefits, barriers and costs of becoming more active, suitable activities, social support, goal setting and relapse prevention. Results at 6-months revealed that significant between-group differences existed in both change in activity counts per week (as measured by accelerometers) and self-report moderate and total activity (p<.001). Additionally, 83% of the treatment group progressed one stage or more, resulting in significant between-group differences in changes in: i) stage of change and, ii) frequency of using processes of change.

Kirk and colleagues' (2004) followed these same participants and evaluated the efficacy of physical activity counseling at 12 months. All intervention strategies were employed again for both the control and treatment group after the 6 month assessment. This time, however, consultations given to the treatment group focused more on relapse prevention and improving long-term maintenance of a physically active lifestyle. Results at 12 months revealed that between-group differences existed in physical activity for both self-report and accelerometer measures ($p<0.01$). Further, between-group differences were recorded in stages of behaviour, as more participants from the treatment group were in active stages ($p<0.01$). Moreover, the treatment group significantly increased the frequency of using processes of change (with the exception of dramatic relief and stimulus control) when compared to controls ($p<0.01$).

Similarly, Kim, Hwang, and Yoo (2004) evaluated a stage-matched intervention for Korean individuals with type 2 diabetes. In this study, intervention participants received stage-matched counseling strategies, exercise behaviour training and telephone counseling based upon the main constructs derived from the TTM. Upon completion, the intervention group showed significant improvements in physical activity levels and stages of change for exercise ($p<.001$), and had a significant reduction in fat body mass and HbA1c ($p<.05$), when compared to the control group. Consequently, this study and Kirk et al.'s (2003, 2004) studies suggest that stage-matched interventions based upon constructs from the TTM may be beneficial for improving physical activity behaviours and related health outcomes among people with type 2 diabetes

In addition to the TTM, the SCT has also been tested and applied to physical activity behaviour for people with type 2 diabetes (Allen, 2004). Several studies have utilized SCT constructs for prevention (.Macaulay et al., 1997) and management (DiLoreto et al., 2003; Glasgow et al., 1992; Keyserling et al., 2002; McKay et al., 2001; Tudor-Locke et al., 2004). Research utilizing SCT for diabetes management interventions have been met with moderate to high success.

Glasgow and colleagues' (1992) focused on improving self-care behaviours among older people with type 2 diabetes. The intervention randomized 102 adults into either an immediate or delayed intervention condition, consisting of 10 sessions of self-management training. The counseling sessions targeted problem-solving skills and self-efficacy, with the goal of improving diet, participation in regular aerobic activity and regular blood glucose monitoring. With regard to physical activity, results of the immediate intervention group at a 6 month follow-up revealed that the mean number of days exercised and mean energy expenditure did not change, however, there was a significant increase in the average minutes of activity per day from their pre-test scores. Additionally, the immediate intervention group showed significant improvements in both problem-solving ability and number of problem-solving strategies used. In contrast, there were no significant improvements in exercise self-efficacy.

McKay and colleagues' (2001) employed an internet-based diabetes education program for sedentary men and women with type 2 diabetes. The intervention was tailored to individual needs and utilized goal setting and on-line social support from both a personal coach and other intervention participants. Upon completion, participants reported a moderate increase in: 1) walking, and 2) moderate-to-vigorous intensity physical activity, however no significant between-conditions were found.

Keyserling and colleagues' (2002) diabetes management intervention study for African American women randomized participants into 3 conditions: clinic only, community-clinic, control. As part of the community-clinic group, participants received peer counseling (3 group sessions and 12 monthly phone calls from a peer counselor), designed to provide social support and reinforcement for behaviour change goals. Upon 1 year follow-up, results revealed that the community-clinic group reported an increase in physical activity energy expenditure (as assessed by accelerometer), and there was a statistically significant overall group effect.

DiLoreto and colleagues' (2003) also used a counseling strategy to enhance physical activity among people with type 2 diabetes. In this study, participants were randomized into usual care and intervention groups in an outpatient diabetes center. All patients were seen by a physician, however, the intervention group received an additional 30 minutes of counseling, a follow-up phone call one month post-session, and 15 minute follow-up appointments every 3 months. Within the initial counseling session the physician followed a structured protocol to promote physical activity, which included discussing motivation, self-efficacy, pleasure, support, comprehension, lack of impediments and keeping a diary. After 2 years, findings demonstrated that energy expenditure of the intervention group was seven times greater than that of the control group ($p<0.001$).

Finally, Tudor-Locke and colleagues' (2004) First Step Program operationalized self-efficacy, outcome expectations and self-monitoring with the goal of increasing physical activity in people with type 2 diabetes. Upon completion of the intervention, pedometer assessed physical activity indicated that a profound increase in daily walking was found in the intervention group relative to the control group ($p<0.0001$), which equaled an approximate 31 minutes of extra walking per day. Tudor-Locke and colleagues therefore concluded that the First Step Program is a practical and feasible intervention to promote walking behaviour in a largely sedentary and overweight/obese population.

2.8. Social Cognitive Theory

Developed by Albert Bandura (1986), SCT proposes that behaviour, including physical activity, is adopted and maintained by a complex set of personal, environment and behavioural influences. Biological (i.e. age, sex, ethnicity) and psychological variables (i.e., attitudes, beliefs, cognitions) are the categories of personal variables (Sallis, Hovell, & Hofstetter, 1992). Environmental variables involve influences external to the person, such as social influences (i.e. support, modeling, persuasion) and physical environment (i.e. access to facilities and programs) (Sallis et al., 1992). SCT consists of ten constructs, which include self-efficacy, self-control, outcome expectations, outcome expectancies, behavioural capability, observational learning, reinforcement, emotional coping response, environment and situation (Bandura, 1986; Baranowski et al, 2002).

2.8.1 Self-Efficacy

Self-efficacy is generally defined as a person's confidence that they can perform a particular behaviour under specific conditions. Self-efficacy is the central concept within SCT and is the foundation for many aspects of behaviour change (Bandura, 1986; Godin

& Shephard, 1990, Marcus et al., 1996). Self-efficacy is thought to be the most influential variable for behaviour change because it affects: 1) whether an individual attempts a given task; 2) the amount of effort applied toward the task; 3) the degree of persistence exerted when difficulties arise; and, 4) the level of performance attained (i.e. the ultimate success) (Baranowski et al., 2002; Godin & Shepherd ,1990). Further, it is postulated that self-efficacy can be influenced through four sources of information: mastery accomplishments, social modeling, social persuasion and physiological states (McAuley, Courneya, Rudolph, & Lox, 1994).

2.8.2 Environment and Situation

The environment refers to objective factors, or factors external to the individual, which can affect one's behaviour (Baranowski et al., 2002). This may include both physical and social environmental variables. In the physical activity domain, an example of the physical environment includes one's access to or availability of facilities and programs.

Social support is often conceptualized as a social environmental variable and may be defined as the "functional and behavioural aspects of a social network" (Heaney & Israel, 2002, p. 186). Social support is consciously provided by the sender, thereby distinguishing it from social influence, which occurs through observation of the behaviour (i.e. observational learning) (Heaney & Israel, 2002). Social support can be received from various members of one's social network, including family members, friends and peers (Baranowski, et al, 2002; Heaney & Israel, 2002). Four types of social support have been identified including emotional, instrumental, informational and appraisal (Heaney & Israel, 2002).

Within the SCT framework, situation differs from environment in that situation refers to *subjective* or *perceptions* of the environment (Baranowski et al., 2002). Situation is therefore a cognitive representation of the environment, which may be real or distorted. When referring to physical activity behaviours, situation may include the perceived neighbourhood environment (i.e., attractiveness, safety, traffic and traffic hazards) and perceived access to neighbourhood facilities (i.e., availability of sidewalks, street lighting) (Brownson et al., 2001; Giles-Corti & Donovan, 2002).

2.8.3 Outcome Expectations and Expectancies

Outcome expectations have often been referred to as antecedent determinants of behaviour (Baranowski et al, 2002). For example, the expectation that a given behaviour will lead to certain outcome. Stated differently, an outcome expectation is a judgment of the likely consequence of a given behaviour, and these may be classified as either beneficial or detrimental (Bandura, 1986). According to Bandura, there are three major categories of outcome expectations: material consequences, social consequences and self-reactions (Dzewaltowski, 1994).

Outcome expectancies differ from outcome expectations in that expectancies are the *values* placed on a specific outcome (Baranowski et al., 2002). Often referred to as incentives, outcome expectancies can be assessed as a scale, ranging from positive to negative (Baranowski et al., 2002). Thus, outcome expectations and expectancies are important cognitive mechanisms that may act as significant motivators for behaviour (Dzewaltowski, 1994).

2.8.4 *Behavioural Capability*

Behavioural capability consists of two separate but interrelated concepts: knowledge and skill. For example, in order for a person to perform a given behaviour they must have knowledge of what the behaviour is, and have the skills necessary to perform it (Baranowski et al., 2002). Physical activity interventions often operationalize behavioural capability by employing skills training to promote mastery of the behaviour.

2.8.5 *Observational Learning*

Observational learning, also termed vicarious experience, occurs when an individual watches the actions of others, and the reinforcements that others receive (Baranowski et al., 2002). From this process, the learner can determine the rules of the behaviour from others (Baranowski et al., 2002). Interventions aimed at increasing physical activity behaviour often utilize credible role models to promote observational learning of the targeted behaviour.

2.8.6 *Self-control*

Within the SCT framework, self-control (also termed self-regulation) can be defined as "personal regulation of goal-directed behaviour" (Baranowski et al., 2002, p. 169). One of the goals of operationalizing this construct in interventions is to bring the behaviour, in this case physical activity, under the personal control of the individual. This may be accomplished through: 1) monitoring one's behaviour, 2) comparing behaviour against personally set standards/goals, 3) being able to solve problems that stand in the way of accomplishing goals, and 4) providing rewards for desirable behaviour (Baranowski et al., 2002).

2.8.7 *Reinforcement*

Reinforcements are used within the SCT framework to increase the likelihood that a desired behaviour is performed. Hence, two types of reinforcements exist, positive and negative. With positive reinforcements a reward is usually offered for a desired behaviour, to increase the likelihood that the behaviour will be repeated (Baranowski et al., 2002). Negative reinforcement also increases the likelihood that the desired behaviour will be repeated, by removing a negative stimulus (Baranowski et al., 2002). Hence, physical activity interventions often employ positive reinforcements through promoting rewards and incentives (both external and internal) for engaging in physical activity behaviour.

2.8.8 *Managing Emotional Arousal*

Bandura proposed that under certain circumstances emotional arousal could be detrimental to learning and performance (Baranowski et al., 2002). For example, specific stimuli could promote fear and/or anxiety, thus resulting in a lack of desired behaviour (Baranowski et al., 2002). Therefore, in order to promote the desirable behaviour, in this case physical activity, these emotions must be managed effectively. Three categories for managing emotional and physiological arousal have been proposed: psychological defenses, cognitive techniques (i.e. problem solving and restructuring) and stress management techniques (Baranowski et al., 2002).

2.9 Measurement

2.9.1 Social Cognitive Theory

To examine SCT constructs, valid and reliable measures must be utilized. SCT constructs within the literature have demonstrated varying degrees of validity and reliability (Marcus, Selby, Niauri, & Rossi, 1992; Plotnikoff et al., 2001; Schuster, Petose, & Petosa, 1995). To date, self-efficacy and social environment have been subjected to the largest amount of testing (Castro, Sallis, Hickman, Lee, & Chen, 1999; Schuster et al., 1995; Wallace et al., 2000). SCT constructs for physical activity have not been validated extensively among people with type 2 diabetes. In a study by Allen (2004), thirteen studies examining the relationship between SCT constructs a (namely self-efficacy and outcome expectancies) and exercise were reviewed. The instrument reliability in those studies reporting internal consistency was wide-ranging, with mean alpha scores of .73 and .66 for self-efficacy and outcome expectancies, respectively.

SCT constructs are typically assessed using Likert scales. The Likert scale is comprised of questions (items) with a 5-point response option ranging from "strongly disagree" to "strongly agree" (Trochim, 2001). The construct is then assessed by aggregating the items to produce a composite score. This approach is based on the assumption that items are affected by the same underlying concept, and constructs are thus unidimensional (Rhodes, Plotnikoff, & Spence, 2004). A more recent suggestion, however, is that specific item-beliefs may actually have distinct associations with physical activity behaviour, which can be hidden through aggregated scales (Rhodes et al., 2004). Subsequently, this approach proposes that constructs are multi-dimensional.

For example, confidence to engage in physical activity despite feeling sore or tired, are items within the self-efficacy construct. An individual may be experiencing soreness and may also be tired, therefore their construct score may accurately reflect their self-efficacy. Nevertheless, the individual may be sore, but may not be tired (or vice versa), therefore the aggregation of these items into a single construct may not correctly reflect their self-efficacy because they are assessing different dimensions of that construct.

Rhodes and colleagues' (2004), for example, examined alternatives to summative scales within a large Canadian sample. Results from this study suggested that item-beliefs, that exert independent influences on physical activity, explained more variance in physical activity than aggregated scales. Consequently, it is suggested that researchers and practitioners assess SCT item-beliefs instead of, or in combination, with constructs. This approach will be beneficial as it may recognize specific influences to target and improve our ability to mediate behaviour within physical activity interventions (Rhodes et al., 2004).

2.9.2 Physical Activity

Physical activity is defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen et al., 1985, p. 126). Nevertheless, physical activity has many dimensions, such as frequency, intensity, duration and mode. There is a variety of methods to assess physical activity including direct observation, heart rate monitors, pedometers or accelerometers, questionnaires and diaries.

Objective measures, for instance, can be utilized for quantifying physical activity behaviour. This includes using fitness testing to collect physiological information, however, this method can be costly and presents ethical issues. The use of pedometers and/or accelerometers is another option, nevertheless, these may also be costly and may inadvertently increase physical activity because of participants awareness of the device.

In comparison, self-report measures such as questionnaires, are a popular method for assessing physical activity behaviours among populations. Although there is some criticism of self-report measures due to recall bias, they are a more effective way to reach large populations at a lower-cost (Sallis & Saelens, 2000; Tudor Locke & Myers, 2001). Further, self-report questionnaires do not change the behaviour under study, and present the possibility to assess all dimensions of physical activity (Sallis & Saelens, 2000).

The Godin Leisure-Time Exercise Questionnaire (GLTEQ) is a validated self-report physical activity instrument that has been used in several research studies (Godin & Shephard, 1997). Miller, Freedson, and Kline's (1994) study comparing self-report to objective physical activity measures reported that the GLTEQ strongly correlated with a personal electronic motion sensor. Further, Gionet and Godin (1989) tested it's validity among an employee sample of Canadian workers and found it was highly correlated with physiological fitness data.

2.10 Summary of Literature Review

Physical inactivity among people with type 2 diabetes remains high. This finding is troublesome, in light of the evidence that physical activity may help people manage diabetes and improve quality of life. Researchers and practitioners continue to explore the determinants of physical activity, so that interventions can de designed and implemented to meet the particular needs and interests of this population.

The Social Cognitive Theory may serve as a useful framework for understanding psychosocial and environmental determinants among people with type 2 diabetes, and exploring how these determinants may differ across demographic groups (Allen, 2004). Gathering this information will help researchers and practitioners target and tailor interventions to the demographic, psychosocial, environmental and physical activity levels of people with type 2 diabetes. In turn, this may improve adherence and efficacy of physical activity interventions, thereby helping people with diabetes to more effectively mange their condition and reduce potential complications.

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Chapter Three – Study One

3.1 Overview of the chapter

This chapter includes a brief introduction, study rationale, study objectives and research questions to be explored. This is followed by the study methods, results and discussion, including limitations and implications for future research, practice and policy.

3.2 Introduction

Physical activity plays a key role in the prevention and management of type 2 diabetes (Sigal, Kenny, Wasserman, & Castaneda, 2004; Wing et al., 2001). Research has shown that intensive lifestyle modification, which includes physical activity, is effective for preventing or delaying the onset of type 2 diabetes among those at risk (Knowler et al., 2002; Pan et al., 1997; Tuomilehto et al., 2001). For those already affected by diabetes, physical activity may help improve glycemic control, reduce blood pressure, and positively affect other CHD risk factors (Boule, Kenny, Haddad, Wells, & Sigal, 2003; Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (CDA), 2003; Tsui & Zinman, 1995).

Despite this, 51% of Canadians within the general population (Canadian Fitness and Lifestyle Research Institute (CFLRI), 2004) and 65% of Canadians with self-report diabetes fail to participate in adequate amounts of physical activity to attain positive health benefits (Health Canada, 2002). It is suggested that these rates of inactivity are even higher for certain population sub-groups, such as women, older individuals,

individuals with a disability, and individuals of lower income and education (Jones et al., 1998; Wen et al., 2002). It remains a challenge for researchers and public health officials to promote physical activity among people with diabetes. As a result, current research is focused on examining the demographic, health and psychosocial determinants of physical activity behaviour.

With regard to demographic determinants, results suggest that gender, age, ethnicity, marital status and socioeconomic status (SES), may be associated with physical activity within the general population (Eyler, 2003; King et al., 1992, Trost, Owen, Bauman, Sallis, & Brown, 2002). For instance, the majority of literature reports that women have lower rates of participation than men in both moderate and vigorous physical activity (King et al., 1992; Marcus, Dubbert, King, & Pinto, 1995; Sherwood & Jeffery, 2000; Trost et al., 2002). Individuals with lower income and education have also shown lower rates of physical activity than those with higher income and education levels (Crespo, Smit, Carter-Pokras, & Anderson, 2001; King et al., 1992).

In terms of psychosocial determinants, several behaviour change theories have been put forth to explain and predict physical activity behaviour. Constructs from the Social Cognitive Theory (SCT), including self-efficacy, outcome expectations, and social support, have shown success for understanding physical activity among the general population (Dzewaltowski, 1994; Sallis, Hovell, & Hofstetter, 1992). More recently, it has also been suggested single item-beliefs of social-cognitive constructs may have their own unique associations with physical activity behaviour (Rhodes, Plotnikoff, & Spence, 2004).

Nevertheless, the association between physical activity and certain social-cognitive constructs may differ across sociodemographic groups. Self-efficacy, for example, exhibits a positive relationship with physical activity, but studies suggest that men and individuals of higher income respectively demonstrate higher self-efficacy scores than women (Netz & Raviv, 2004) and individuals of lower income (Clark & Notwehr, 1999). Similarly, studies suggest that social support is associated with physical activity, however, the source of support may differ between gender and SES groups (Booth, Bauman, Owen, & Gore, 1997; Oka, King, & Young, 1995; Wallace, Buckworth, Kirby, & Sherman, 2000).

Among people with diabetes, studies thus far have been limited and the results inconsistent. Of the studies that do exist, research has revealed that physical activity is positively associated with younger age (Hays & Clark, 1999; Nelson, Reiber, & Boyko, 2002), male gender (Nelson et al., 2002; Notwehr & Stump, 2000), white ethnicity (Nelson et al., 2002), and higher education (Hays & Clark, 1999). The utility of the SCT for physical activity behaviour has also been examined among those with type 2 diabetes. Several studies have reported an association for self-efficacy (Kingery & Glasgow, 1989; Padgett, 1991; Skelly, Marshall, Haughey, Davis, & Dunford, 1995), outcome expectations (Kingery & Glasgow, 1989), and social support (Pham, Fortin, & Thibaudeau, 1996; Wilson et al., 1986) with physical activity in this population. Moreover, SCT-based interventions operationalizing self-efficacy, social support, outcome expectations, goal setting, self-monitoring, problem-solving and reinforcements, have been met with moderate to high success for behaviour change (DiLoreto et al., 2003; Keyserling et al., 2002; McKay, King, Eakin, Seeley, & Glasgow, 2001; Tudor-Locke et al., 2004).

Hence, it appears the SCT may offer promise for exploring the relationship between physical activity behaviour and certain social-cognitive constructs and items among people with type 2 diabetes. Notwithstanding, it is also important to explore demographic characteristics, as they may differentially affect physical activity behaviour and related social-cognitive influences on physical activity among this population.

3.3 Rationale of the Study

To date, there is a limited understanding of the psychosocial determinants of physical activity among people with type 2 diabetes. Further, it is suggested that differences in: 1) prevalence of physical activity behaviour, and 2) psychosocial determinants of physical activity behaviour, exist between certain demographic groups, namely gender and SES. Consequently, these potential gender and SES differences need to be explored so that interventions can be targeted and tailored to more specifically meet the needs of people with type 2 diabetes.

3.4 Objective of the Study

Study One is a secondary-level quantitative analysis of surveys completed by adults with type 2 diabetes (N=1614). The first objective is to determine whether physical activity behaviour differs within and between gender, and income and education. The second objective is to examine whether the strength of potential relationships between leisure-time physical activity (LTPA) and selected SCT constructs and item-beliefs differs within gender and SES groups.

This study employs four research questions:

1) Does LTPA significantly differ:
    - i) within gender (i.e., men and women);
    - ii) within income groups (i.e., low, middle, and high);
    - iii) within education groups (i.e., did not complete high school, completed high school, and completed a university/college degree); and,
    - iv) between gender and: a) income, and b) education.

2) Do types of leisure and non-leisure physical activities significantly differ:
    - i) within gender (i.e., men and women);
    - ii) within income groups (i.e., low, middle, and high);
    - iii) within education groups (i.e., did not complete high school, completed high school, and completed a university/college degree);
    - iv) within income groups for: a) men, and b) women; and,
    - v) within education groups for: a) men, and b) women.

3) Do the associations between LTPA and SCT constructs (i.e., self-efficacy, social support, and outcome expectations), significantly differ:
    - i) within gender (i.e., men and women);
    - ii) within income groups (i.e., low, middle, and high);
    - iii) within education groups (i.e., did not complete high school, completed high school, and completed a university/college degree);
    - iv) within income groups for: a) men, and b) women; and,
    - v) within education groups for: a) men, and b) women.

4) Do the associations between LTPA and SCT item-beliefs significantly differ:
    - i) within gender (i.e., men and women);
    - ii) within income groups (i.e., low, middle, and high);
    - iii) within education groups (i.e., did not complete high school, completed high school, and completed a university/college degree);
    - iv) within income groups for: a) men, and b) women; and,
    - v) within education groups for: a) men, and b) women.

3.5 Methods

3.5.1 Background

This study is part of a larger research project, the **A**lberta **L**ongitudinal **Ex**ercise **a**nd **D**iabetes **R**esearch **A**dvancement (*ALEXANDRA*) Study[1] (Plotnikoff et al., 2001-2005). The study surveyed a sample (n=2319) of Albertans, aged 18 years and older with type 1 or type 2 diabetes. Participants were recruited via two protocols. The first strategy involved a convenience sample of 1923 individuals (609 type 1; 1307 type 2; 7 missing type) from the Canadian Diabetes Association registry Alberta Chapter. The second strategy recruited individuals (88 type 1; 307 type 2; 1 missing type) using a randomized digit dialing protocol of Albertan households. The two samples yielded no significant differences on demographic, health and behavioural variables ($p<0.5$), and were therefore pooled for subsequent analysis. The study was approved by the Human Ethics Board of the Faculty of Physical Education and Recreation at the University of Alberta (Appendix III).

3.5.2 Sample

Surveys were conducted with 1614 individuals with type 2 diabetes. Sociodemographic characteristics of the sample are displayed in Table 1. The average age was 63 years (SD=12.1), with the average age of diagnosis at 52 years (SD=15.0). The sample consisted of 51% men and 49% women, of which 74% defined themselves as Canadian in ethnicity, and 76% and were currently married or with partner. Of the 1614 participants, 53% were retired, 69% were classified as middle income, and 75% had completed a high school degree or higher. With regard to health factors, 8% were current smokers, 22% were administering insulin daily and 67% were taking diabetic pills daily. Approximately 80% of the sample had a BMI greater or equal to 25, and were therefore classified as overweight or obese. Furthermore, 70% of participants were classified as *inactive*, thus not meeting the recommended guidelines of 600 MET.minutes of moderate and/or strenuous activity per week (Brown & Bauman, 200). This criterion reflects achieving 30 minutes of moderate activity (4 METS) on five days each week, as prescribed by the Centers for Disease Control (CDC) and the American College of Sports Medicine (ACSM) (Pate et al., 1995). The characteristics of the sample from this study generally reflect Canada's diabetic population in terms of age, sex and physical activity behaviour (Health Canada, 2002). (See Table 1).

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[1] **ALEXANDRA study co-investigators include Birkett, Courneya, Johnson, Raine, Sigal & Svenson. The ALEXANDRA study is funded by the Canadian Diabetes Association (CDA) and Alberta Heritage Foundation of Medical Research (AHFMR).**

3.5.3 Procedures

Participants in the *ALEXANDRA* study completed self-report questionnaires at three time points: baseline (Spring 2002), 6 months (Fall 2002) and 18 months (Fall 2003). The questionnaires contained biomedical, sociodemographic, psychosocial and behavioural measures related to physical activity. The current study, however, examined self-report demographic characteristics, psychosocial variables and physical activity behaviours collected at baseline (Spring 2002). Additional self-report physical activity behaviours were examined at 6 months (Fall 2002) for Research Question Two.

3.5.4 Instrumentation

Demographic & Health Variables

Demographic factors were measured using questions based on Statistics Canada (2001a) census. Participants were asked to indicate *age, gender, ethnic origin, marital* *status* (options include never married, married, common law, separated or divorced, and widowed), *education* (ranging from some grade school to completed graduate school), *current employment status* (options include homemaker, full-time paid, part-time paid, retire, temporarily unemployed, volunteer), and *gross annual family income* (ranging from <$20,00 to >$100,00). For analysis purposes, participants were grouped into education categories, including: i) not completed high school (n=399); ii) completed high school (n=654); and, iii) completed a university/college degree (n=545). Income categories were based on Alberta income cutpoints (National Council on Welfare, 2004), which included i) low income (<$20,00) (n=203), ii) middle income ($20,00-$79,999) (n=991), and iii) high income (>$80,000) (n=250). (See Appendix I, Time 1 Questionnaire, Section K).

Health status was assessed using previously published self-report measures (Plotnikoff, Brez, & Brunet, 2003; Plotnikoff, Brez, & Hotz, 2000). Participants were asked about their smoking status, and whether they take: i) insulin and/or ii) diabetic pills, everyday for their diabetes (yes/no format). Further, participants were asked to indicate their height (in feet/inches or meters/centimeters) and weight (in pounds or kilograms), in order to assess BMI (kg/m2). BMI categories, as defined by Health Canada (2003), include underweight (< 18.5), normal weight (18.5-24.9), overweight (25.0-29.9) and obese (>30). (See Appendix I, Time 1 Questionnaire, Section J).

Leisure-Time Physical Activity Behaviour

A modified version of the Godin Leisure-Time Exercise Questionnaire (GLTEQ) was used to assess leisure-time physical activity (LTPA) (Godin & Shephard, 1997) (Appendix I, Time 1 Questionnaire, Section A). LTPA was based on the definition that the physical activity session was longer than 10 minutes in duration and was not part of employment or household chores. Based on an average of the past month, participants were asked to indicate: 1) frequency (times per week), and 2) duration (average time per session), of activity in each one of the three intensity categories (strenuous, moderate or mild). Participation responses were then converted into MET.minutes by multiplying weekly minutes of mild activity by 2.5 METS (Ainsworth et al., 2000), moderate activity by 4 METS and vigorous activity by 7.5 METS (Brown & Bauman, 2000).

For data analyses, LTPA was calculated using strenuous and moderate activity only, yielding a MET.minutes per week value (Table 2). Mild activity was not included because: 1) all psychosocial variables in the questionnaire make reference to intensity levels of moderate or greater, and 2) population-based MET values have only been assigned for moderate activity or greater (Brown & Bauman, 2000).

Types of Leisure-Time & Non-Leisure Physical Activity Behaviours

The National Health Interview Survey (NHIS) was used to assess differences in proportions of leisure and non-leisure physical activities (National Center for Health Statistics, Centers for Disease Control, 1997) (Appendix I, Time 2 Questionnaire, Section A). Using the NHIS, participants were asked to indicate whether in the past two weeks they participated in a selected activity (yes/no format). Selected leisure-time activities included walking for exercise, jogging/treadmill, stretching, stair climbing, exercise or aerobics classes, machine exercise at home, non-machine exercise at home, weight lifting, gardening, dancing, bowling, swimming, cycling, yoga/tai chi and golf. Selected non-leisure activities included being physically active while playing with children, household chores, yardwork/shoveling snow, moving/pushing/lifting heavy objects at work, and walking at work.

Self-Efficacy Measure

Self-efficacy is defined as a person's confidence that they can perform a particular behaviour under a specific situation (Baranowski, Perry, & Parcel, 2002). For this study, self-efficacy was assessed by a measure initially developed by Marcus, Selby, Niaura, and Rossi (1992) and modified by Plotnikoff, Hotz, Birkett, and Courneya (2001). Items were assessed using a 5-point Likert-type scale ranging from 1 (not at all confident) to 5 (extremely confident), to measure participants' perceived confidence of participating in regular physical activity under varying circumstances (Appendix I, Time 1 Questionnaire, Section D). The self-efficacy scale consisted of 13 items, with 3 items specific to those with diabetes (Table 3). The items were summed and averaged to calculate a self-efficacy composite score (likewise for the other SCT constructs in this study). The 13-item self-efficacy scale had good internal consistency, with a Cronbach alpha coefficient of .95.

Outcome Expectations

Outcome expectations have often been referred to as one's belief that a given behaviour will lead to certain outcome (Baranowski et al., 2002). The decisional balance scale from the Transtheoretical Model (TTM) was used as a proxy measure for Outcome Expectations. The decisional balance questionnaire (Pros and Cons) was originally designed by Marcus, Rakowski, and Rossi (1992), and adapted for a Canadian population by Plotnikoff et al. (2001). Seventeen items were assessed using a 5-point Likert-type scale ranging from 1 (not at all) to 5 (very much), to indicate the extent to which a perceived positive or negative outcome would result from engaging in physical activity (Appendix I, Time 1 Questionnaire, Section E).

From the decisional balance scale, Pros were used as a proxy measure for positive outcome expectations, which included 7 items, 3 of which were specific to people with diabetes (Table 4). Cons were used as a proxy measure for negative outcome expectations and these included 10 items, of which 4 were directly related to people with diabetes (Table 4). Pros and Cons were interspersed to avoid response-set behaviour. Cronbach's alpha was .88 for the positive scale and .76 for the negative scale.

Social Environment

Social support is defined as aid and assistance exchanged through social relationships (Heaney & Israel, 2002). Using a 5-point Likert type scale (1=strongly disagree to 5=strongly agree), participants were asked about the social support they receive from others to engage in regular physical activity (Appendix I, Time 1 Questionnaire, Section I). Social support was assessed by 3-items from a measure originally reported Courneya, Plotnikoff, Hotz, and Birkett (2001) (Table 5). Cronbach's alpha for the 3-item scale was .68, however, upon removal of item #2 the internal consistency increased to .74. Item #2 was therefore deleted from the scale for analysis. The correlation between the two remaining items was .59 (p<.01).

3.6 Data Screening

3.6.1 Procedures

Screening of the data followed a protocol outlined by Tabachnick and Fidell (2001) prior to analysis: 1) inspect univariate statistics for accuracy of input (i.e., check out of range values, plausible means and standard deviations, and univariate outliers); 2) evaluate amount and distribution of missing data, and deal with problem; 3) Check pairwise plots for nonlinearity and heteroscedasticity; 4) Identify and deal with non-normal variables (i.e., check skewness and kurtosis, transform variables if desirable, and check results of transformation); 5) Identify and deal with multivariate outliers; and, 6) Evaluate variables for multicollinearity and singularity.

3.6.2 Socio-Demographic and Health Variables

Excluding age, height and weight, all demographic variables were categorical, thus permitting only certain responses. Frequency checks were run to ensure that data were within the appropriate range. Missing data ranged between 0 – 10.5%. The largest amount of missing demographic data was on the income variable (10.5%). The decision was made to leave this missing data, as it appeared to be randomly distributed by cases and instrument sections.

3.6.3 Social Cognitive Variables

The construction of the social-cognitive scales (i.e., Likert-type scales) permitted only certain responses, thus frequency checks were run and data were within the appropriate ranges. The means and standard deviations of the variables appeared to be plausible.

The amount of missing data at the item-level ranged between 1.4 – 8.0%. When participants responded to at least one item in the construct, a mean score was calculated based on the completed responses for that construct (K.S. Courneya, personal communication, February 1, 2005). At the construct-level, missing data ranged between

1.9 – 3.1%. For this missing data, mean substitution was used, thereby replacing the mean of the entire sample for each missing case (Tabachnick & Fidell, 2001).

SCT constructs were screened for normality. It was revealed that skewness and kurtosis for self-efficacy (-.20, -.15), positive outcome expectations (-.83, .71), negative outcome expectations (.92, .94) and social support (-.15, -.09) were minimal. Bivariate scatterplots were run for SCT constructs (independent variable) and LTPA behaviour (dependent variable) to check for linearity and homoscedasticity. These scatterplots demonstrated diverse levels of homoscedasticity, most likely caused by non-normality of the dependent measure in this study (see Physical Activity Behaviour section below). Correlations for SCT and LTPA were screened for multicollinearity (variables highly correlated i.e., 0.90 and above) and singularity (perfect correlation). Within our correlational matrix, there were no values above .90, therefore multicollinearity and singularity were not an issue.

3.6.4 Physical Activity Behaviour

For the modified GLTEQ, primary data (frequency and duration of activity in each of the three intensity categories) were screened and all values were within a realistic range. The means and standard deviations of the variables appeared to be plausible. For missing cases, mean substitution was used, thereby replacing the mean of the entire sample for each primary-level variable[2]. Mean substitution was chosen because it is a conservative procedure that does not change the mean of the distribution as a whole, and allows all cases to be retained (Tabachnick & Fidell, 2001). For example, many participants only partially completed the Godin, thus their original data could be used in combination with mean substitution for variables they did not complete, which in turn would help to ensure accuracy and representativeness in calculating composite physical activity scores.

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[2] The term 'missing' referred to any item in the GLTEQ left unanswered by the participant. Analyses for missing items were conducted by i) list-wise deletion; and ii) mean substitution. No meaningful differences in results were found using the two procedures.

LTPA composite scores were calculated as strenuous and moderate weekly MET.minutes. LTPA composite scores were screened for normality. Consequently, skewness and kurtosis were found to be very high, 9.24 and 129.93, respectively. Tabachnick and Fidell (2001) recommend that if the distribution differs substantially from normal, a log transformation should be used. Composite scores for MET.minutes/week were therefore transformed using LOG10 criterion. Analysis with the transformed data did not have a meaningful difference, subsequently a decision was made to use the original untransformed data for analysis because transformed data is often difficult to interpret (Tabachnick & Fidell, 2001).

To identify multivariate outliers, box plots were produced. Upon examination of the plots, it was evident that there were several participants with extreme values. According to Tabachnick and Fiddell (2001), cases above 3.29 standard deviations are considered potential outliers. A decision was made to truncate cases to 3.29 standard deviations to reduce the impact of these outliers. This resulted in the truncation of 15 cases. Upon truncation, skewness and kurtosis were reduced to 2.63 and 8.88, respectively.

3.7 Data Analysis

3.7.1 Research Question One

Two-way, between groups analyses of variance (ANOVA's) were used to assess group differences in mean scores on self-report LTPA. Two separate ANOVA's were conducted to assess main and interactive effects of: 1) gender and income, and 2) gender and education, on LTPA. Post-hoc comparisons using the Tukey Honestly Significant Differences test were conducted. The Tukey HSD test permits only pairwise comparisons and is appropriate for most research designs (Vincent, 1999). LTPA was assessed using the modified Godin Leisure-Time Exercise Questionnaire, and calculated as strenuous and moderate MET.minutes per week.

In these analyses, two assumptions were violated: 1) normal distribution, and 2) homogeneity of variance. It is reported however, the ANOVAs are reasonably robust to violations of these assumptions (Tabachnick, 2001). Nevertheless, in an attempt to compensate for violating these assumptions, the dependent variable was transformed using the LOG10 criterion. Subsequent analysis with the transformed data revealed no meaningful differences in results of the analyses.

3.7.2 Research Question Two

Chi-square tests for independence were performed to examine group differences in leisure activities and non-leisure activities. Three separate chi-square analyses were produced. The first was a 2 X 2 analysis for activity (yes, no) and gender (men, women) (Table 6). The other two analyses resulted in 2 x 3 tables for activity (yes, no) and: 1) income (low, middle, high) (Table 7); and, 2) education (not completed high school, completed high school degree, completed university/college degree) (Table 8). Activities were assessed with the NHIS, using a dichotomized response option (yes/no) for each activity option. Leisure activities examined for analyses were the fifteen most frequently selected leisure activities for the entire sample, which included walking, stretching, stair climbing, jogging/treadmill, machine exercise at home, non-machine exercise at home, weightlifting, gardening, aerobics classes, dancing, bowling, swimming, cycling, yoga/tai chi, and golf. Non-leisure activities included playing with children, household chores, yardwork/shoveling snow, walking at work and moving/pushing heavy objects at work.

For gender analysis, Yates Correction for Continuity was used to assess significance of the test. It is argued that Continuity Correction should be used to compensate for the overestimation of the chi-square of a 2 X 2 table (Tabachnick, 2001). For both income and education analyses, Pearson Chi-Square was used.

3.7.3 Research Questions Three & Four

Pearson product-moment correlations were conducted to examine the association between LTPA and selected SCT constructs and item-beliefs (i.e., self-efficacy, social support, positive outcome expectations, and negative outcome expectations. At the item-belief level, two items of the negative outcome expectations scale did not significantly correlate with LTPA for the entire sample or any gender, income, and education groups ($p > .05$). These items were "Regular physical activity may lead to an insulin reaction" and "Regular physical activity will require me to let others know I have diabetes". These items were therefore not used for subsequent analyses. LTPA was assessed using the modified GLTEQ, and calculated as strenuous and moderate MET.minutes per week.

Correlation coefficients were then converted into z scores using Fisher Z transformations, which "is a mathematical transformation of r, that has an approximately normal sampling distribution irrespective of *p* or n" (Glass & Hopkins, 1996, p. 355). The resulting z scores were used in a mathematical equation to calculate the observed value of z (z obs value), which is a parametric test of the equality of two Pearson correlations from independent samples (Darlington & Carlson, 1987). Consequently, the observed value of z will assess whether the strength of association for correlation coefficients significantly differed (at both the construct and item-belief level): i) within gender; ii) within income groups; iii) within education groups; iv) within income groups for men and women; and, v) within education groups for men and women (Tables 9-16). To test whether the correlation coefficients *significantly* differed the following cut-offs were used: 1) If the z obs value was 1.96 (or -1.96) or greater, the difference was significant at the .05 level, and 2) If the z obs value was 2.58 (or -2.58) or greater, the difference was significant at the .01 level (Blalock, 1972; Glass & Hopkins, 1996).

Due to the multiple comparisons for the SCT item-level analyses, it is acknowledged that by chance some results may be significant. We have therefore reported results at both the .05 and .01 levels so that the reader can interpret the results for themselves.

3.8 Results

3.8.1 Research Question One

The first ANOVA examined main and interaction effects of gender and income on LTPA. Results revealed that there was a significant main effect for gender [F(1,1438)=7.7, partial-eta squared=.01, p<.01], with men (M=730.4, SD=862.4) participating in more LTPA than women (M=532, SD=610.2). Findings also revealed a significant main effect for income [F(2,1438)=3.72, partial-eta squared=.01, $p<.05$)]. Post-hoc comparisons using Tukey HSD indicated that high-income individuals (M=783.7, SD=846.4) participate in significantly more LTPA than middle (M=611.88, SD=727.68, $p<.01$), and low income groups (M=572.7, SD=779.6, $p<.01$). No significant interaction effects were found.

The second ANOVA examined whether main and interaction effects existed for gender and education on LTPA. A main effect for gender, but not education, was revealed [F(1, 1592)=20.87, partial-eta squared=.01, $p<.001$]. The ANOVA demonstrated once again that men (M=720.5, SD=856.4) report participating in more LTPA than women (M=535.7, SD=602.9) ($p<.001$). No significant interaction effects were found.

3.8.2 Research Question Two

Walking (74%) was the most frequently chosen leisure-time physical activity for the entire sample, followed by stretching exercises (32%), stair-climbing (26%), jogging/treadmill (19%), machine exercise at home (18%), non-machine exercise at home (17%), weightlifting (16%), gardening (14%), aerobics classes (10%), dancing (7%), bowling (6%), swimming (6%), cycling (5%), yoga/tai chi (3%), and golf (3%). Household chores (77%) was the most frequently reported non-leisure physical activity.

Gender Differences

Chi-square analysis revealed that men and women differ in leisure-time physical activities (Table 6). For example, women were significantly more likely than men to participate in stretching (χ^2=8.57), stair climbing (χ^2=20.7) aerobics classes (χ^2=19.53), and yoga/tai chi (χ^2=16.22) ($p<.01$). In contrast, weightlifting (χ^2=9.38, $p<.01$) and golf

(χ^2=5.25, p<.05) were favoured among men. When non-leisure activities were examined, significantly more women than men reported engaging in household chores (χ^2=85.58) and playing with children (χ^2=7.34) (p<.01). Yardwork (χ^2=58.49), walking at work (χ^2=11.5) and moving heavy objects at work (χ^2=18.19) were more common activities among men (p<.01).

SES Differences

For the entire sample, significant differences existed between income groups in the frequency of leisure and non-leisure physical activities across income groups (Table 7). Across education groups, the only significant difference in leisure-time physical activity was found in weightlifting, as those who had completed university/college degree reported weightlifting the most (χ^2=9.02, p<.05) (Table 8). For non-leisure activities, those who had completed a university/college degree also reported more walking at work than the other two groups (χ^2=10.4, p<.01) (Table 8). When differences between income and education groups were examined separately for men and women, certain patterns emerged .

Among men, high income individuals participated in more jogging/treadmill (χ^2=11.6) and weightlifting (χ^2=12.13) than the two other lower income groups (p<.01). Conversely, low income men were more likely to report playing with their children than the other two groups (χ^2=11.24, p<.01). (See Table 7).

For women, high income individuals reported participating in the most jogging/treadmill (χ^2=6.0), however, low income individuals reported participating most frequently in non-machine exercise at home (χ^2=8.36) (p<.05). In terms of non-leisure-time activities, high income women (χ^2=11.69) and women who had completed a university/college degree (χ^2=17.98) were more likely to report walking at work than the other two groups (p<.01). Further, a greater proportion of high income women reported playing with their children than middle and low income individuals (χ^2=8.46, p<.05). (See Table 7).

3.8.3 Research Questions Three & Four

Gender Differences

Correlation analyses and subsequent Fisher Z transformations revealed no significant differences existed between men and women in the strength of association for leisure-time physical activity (LTPA) with self-efficacy, social support, positive and negative outcome expectations (p>.05; Table 9). Nevertheless, findings revealed that men and women significantly differ on two items within the self-efficacy scale. Men reported a stronger positive relationship between LTPA and confidence to do activity when the weather is bad ($r=.38_{men}$, $r=.28_{women}$), and when they have to let others know they have diabetes ($r=.30_{men}$, $r=.19_{women}$) (p<.05; Table 10).

SES Differences

Findings revealed significant differences in correlation coefficients for self-efficacy between all income groups (Table 9). For example, self-efficacy was more positively associated with LTPA for individuals of high-income (r=.55), than those of middle (r=.42, p<.05) or low- income (r=.28, p<.01). Further, a significant difference for LTPA with self-efficacy existed between middle (r=.42) and low (r=.28) income individuals (p<.05). Significant differences also existed between income groups for several items in the self-efficacy scale (Table 10).

With regard to outcome expectations, high income individuals demonstrated a stronger positive relationship for LTPA with positive outcome expectations (r=.29), and a stronger inverse relationship for LTPA with negative outcome expectations (r= -.24), than low income individuals (r=.09 and r= -.04, respectively) (p<.05; Table 9). Moreover, positive outcome expectations was more highly related to LTPA for those who had not completed high school (r=.27) than those who had completed a university/college degree (r=.13) (p<.05; Table 9). For both income and education, significant differences also existed between certain SES groups for items on outcome expectation scales (Table 11).

SES Differences for MEN

Men and women were analyzed separately to examine differences in correlation coefficients across income and education. Similar to findings for the entire sample, significant differences existed between low (r=.19), middle (r=.44) and high (r=.60) income men for LTPA with self-efficacy, and between low (r=.04) and high (r=.32) income men for LTPA with positive outcome expectations (ps<.01-.05; Table 12). Across education groups, both men who did not complete high school (r=.32) and men with a high school degree (r=.28) demonstrated a significantly stronger positive relationship for LTPA with positive outcome expectations than those who had completed a college/university degree (r=.12) (p<.05; Table 12).

With regard to items on the self-efficacy scale, middle income men exhibited a stronger positive relationship than low income men, for LTPA with confidence to do physical activity when in a bad mood (p<.01), and when stiff/sore, have other demands on time, and have to do activity by self (ps<.05). Further, high income men demonstrated a stronger positive relationship than low income men for LTPA with confidence to do activity when tired, feel ill, in a bad mood, stiff/sore, activity is boring, have other demands on time (ps<.01), when no noticeable fitness improvements, have to do activity by self, have to find different activities due to complications, and have to let others know I have diabetes (ps<.05). The only differences among correlation coefficients between middle and high income men was that high income men showed a greater association for LTPA with confidence to do activity when in a bad mood, stiff/sore and when they have other demands on time (ps<.05). Correlation coefficients for self-efficacy items ranged from .06 to .54 across income groups. (See Table 13).

For items on the positive outcome expectation scale, middle and high income men reported a stronger positive relationship between LTPA and the anticipated outcome that physical activity would reduce stress and help me sleep better, than low income men (ps<.01-.05; Table 10). High income men also exhibited a greater positive association than middle income men for LTPA with the belief that physical activity would reduce stress (p<.05; Table 10). Correlation coefficients for positive outcome expectations items ranged from -.14 to .35 across income groups. (See Table 14).

Across education groups, those who did not complete high school demonstrated a stronger positive association between LTPA and the anticipated outcome that physical activity would help reduce stress and would feel more confident about my health, than those who had completed a college/university degree (ps<.05). Moreover, a stronger positive relationship was seen between LTPA and the expected outcomes that physical activity would help me to feel more confident about my health and control my weight for those who had completed a high school degree, than those with a college/university degree (ps<.05). Correlation coefficients for positive outcome expectations items ranged from .04 to .33 across education groups. (See Table 14).

Finally, with regard to negative outcome expectation items, the only observed differences among men was that both those who had completed a high school degree (r= -.15) and a university/college degree (r= -.16) exhibited stronger negative associations for LTPA with the belief that activity would make me feel awkward, than those who had not completed high school (r=.04) (p<.05; Table 14).

SES Differences for WOMEN

When examining women across income and education, no significant group differences existed for LTPA and self-efficacy, social support, and outcome expectations constructs (p>.05; Table 12). Notwithstanding, at the item-belief level a stronger positive relationship between LTPA and confidence to do activity when the weather is bad was found for women who had completed a college/university (r=.37) when compared to women with a high school degree (r=.20) (p<.05; Table 15). Further, women who had completed a college/university degree (r= -.18) exhibited a stronger inverse relationship for LTPA with the anticipated outcome that physical activity would take too much time, than women with a high school degree (r=.03) (p<.05; Table 16).

3.9 Discussion

Results demonstrated that among people with type 2 diabetes, men report participating in significantly more LTPA than women. Indeed the literature within the general population consistently reports that women participate in less physical activity than men (King et al., 1992; Trost et al., 2002), and this trend also exists among people with diabetes (Nelson et al., 2002; Notwehr & Stump, 2000). The literature suggests, however, that studies may not assess all gender-specific activities, or activities of lower intensity that are preferred by many women (Ainsworth, Richardson, Jacobs, & Leon, 1993; Speck & Harrell, 2003). It is therefore argued that traditional physical activity questionnaires may not adequately capture the activities relevant to women's lives, and thus when mild activity is included, gender differences may disappear (Ainsworth et al., 1993; King et al., 1992; Marcus et al., 1995). A re-analyses of our study's results including mild activity, however, did not change our findings.

Numerous studies in the general population have also shown that socioeconomic status is positively associated with leisure-time physical activity (King et al., 1992; Trost et al., 2002). Among people with type 2 diabetes, similar patterns are suggested, nevertheless studies are limited and inconsistent (Hays & Clark, 1999). Our study revealed that among people with type 2 diabetes, individuals with a high income reported participated in significantly more LTPA than those of middle and low income. This finding may be related to access and availability of facilities/resources, as higher income individuals may have a greater ability to endure the costs associated with certain physical activities. Nevertheless, differences in LTPA across education groups did not exist. This finding is interesting because research from Statistics Canada (2001b) suggests that SES indicators, such as income and education, are interrelated with most low earners having a high school education or less, while most high earners have a university degree.

One possible explanation for lack of educational differences in this study is that education may not be a reliable measure of SES for physical activity behaviour among this population. As Cauley, Donfield, LaPorte, and Warhaftig (1991) explain, age differences exist for educational attainment, as older age groups usually have less formal education. Since people with type 2 diabetes are typically older, lack of educational differences in our study may reflect the older age of our sample (M=63 yrs).

Walking was the most frequently reported leisure-time activity for the entire sample. This finding is consistent with literature from both the general (Eyler, Brownson, Bacak, & Houseman, 2003, King, Taylor, Haskell, & DeBusk, 1990) and diabetic (Krug, Haire-Joshu, & Heady, 1991; Wanko et al., 2004) population. In a Canadian sample, Plotnikoff (in press) and Plotnikoff et al. (2003) also reported that walking was the popular leisure-time physical activity, and this did not significantly differ between those with and without diabetes.

In this study, the proportions of those who walked for physical activity did not significantly differ between men and women, and SES groups. In contrast, other studies have reported that leisure-time walking behaviours do differ between gender and SES groups (Brownson et al., 2000). For example, Brownson and colleagues' (2000) reported that regular walkers were more likely to be persons aged 60 years and older, and those with higher education and incomes of $35,000 or higher. Eyler and colleagues' (2003) examined correlates of walking in a US national sample and reported similar results, as 23.8% of those with less than a high school education were regular walkers, compared to 41.2% of those with a college education. Cauley et al. (1991), however, found those of *lower* SES reported more walking than those of higher SES amongst women, but not men.

Results of the present study revealed several gender differences in other leisure and non-leisure activities. These results were consistent with other studies that report aerobics classes were more common for women, while weightlifting/strengthening exercises and yardwork were more common among men (Booth et al., 1997; Sherwood & Jeffrey, 2000). The finding that men report participating in more golf is intuitive as golf has traditionally been considered *a man's sport, and* women's golfing associations have only been founded within the last 50 years (White, 2002). With more women taking up the sport and the increasing visibility of professional women golfers, however, such differences may begin to disappear.

With regard to non-leisure activities, women reported engaging more frequently than men in household chores and playing with children. This finding may be reflective of the fact that women are more inclined to include lifestyle activities as part of their definition of physical activity (Ainsworth et al., 1993; Jacobs, 2000; Marcus et al., 1995). Moreover, men reported participating in more physical activity at work, a realistic finding considering that a much greater percentage of men (25%) than women (5%) are employed in manual labour occupations, such as trades, transport and equipment operators (Statistics Canada, 2001b).

Across income groups, differences in leisure-time and non-leisure activities also existed. For example, low income individuals were more likely to report engaging in stair climbing for activity. This trend seems plausible as lower income individuals may be more likely than high income individuals to rent accommodation, rather than own their own premises. Hence, many rental properties are apartment buildings where there are a number of stairs/stairwells to engage in activity. Results of the present study also showed that higher income individuals were more likely to report participating in yardwork and/or shoveling snow, once again possibly due to the fact that they may own properties where this type of activity is required.

It is also speculated that the differences among other leisure-time activities across SES may have to do with the access and availability of resources. In the present study, for example, lower income individuals were more likely to participate in *non-machine* exercise at *home*. This may, in part, be related to the cost of machines for the home or the cost of a gym membership. Conversely, higher income individuals in our study were more likely to report engaging in jogging/treadmill and weightlifting, activities that require home or gym equipment.

With regard to non-leisure activities, a greater proportion of lower income individuals reported engaging in household chores. A possible explanation for this finding is that higher income individuals may be able to afford regular housecleaners. Similar trends have been reported within the general population, where a negative association has been revealed for SES and household activity (Ford et al., 1991; Sternfeld, Ainsworth, & Queensberry, 1999). Nevertheless, Ford and colleagues' (1991) reported a reverse trend was true for women only, where women of higher SES spent more time per week in household physical activity than lower SES women.

When examining men and women separately across SES, several interesting trends were observed, specifically for non-leisure activities. For example, women of higher income and education reported more walking at work as part of their physical activity than women of lower income and education. These results are consistent with a study by Ford and colleagues' (1991) who reported that higher SES women spent more time in job-related physical activity than lower SES women. One possible explanation for this finding is that the majority of Canadian women of high income and education are employed as lawyers, general practitioners, and sales, marketing and advertising managers (Statistics Canada, 2001b). These types of occupations may require walking between multiple buildings/sites and thus women in these positions accumulate a lot of on-the-job physical activity. Conversely, the most common occupations for Canadian women of lower income and education are retail salespersons, clerks and cashiers (Statistics Canada, 2001b), positions which are may be sedentary. Additionally, income differences in "walking at work" may not be relevant for men, as the most common occupation for Canadian men of lower income is farming (Statistics Canada, 2001b), an occupation which requires a great deal of physical activity.

The most interesting and contradictory finding, however, was that low income men compared to high income women reported playing with their kids more than other income groups. For women, this is contrary to findings by Sternfeld and colleagues' (1999) who reported that high levels of care-giving activity was associated with lower levels of SES. High income women in our sample may have a greater flexibility to choose to be homemakers due to a high income brought in by their spouse, thus allowing them more free time to play with their children. Conversely, high income men may not report playing with their kids as much as low income men because the most common jobs of high income men are in sales, marketing and advertising (Statistics Canada, 2001b), and these occupations typically require long hours and/or frequent travel. Nevertheless, these findings must be interpreted with caution. Even though the question specifically asked about how much time they spend playing with children, some people may not view playing with their children as part of their physical activity, and thus may not have answered the question appropriately. Additionally, since our sample is older (M=63 years), many participants do not have young children or any children living at home, therefore differences across income groups may not be representative.

The Relationship between SCT and LTPA

When examining the relationship between LTPA and selected SCT constructs, men and women did not differ in the strength of association for correlations. Hays and Clark's (1999) study among people with type 2 diabetes indicated that men and women did not differ on outcome expectations mean scores. Nevertheless, Hays and Clark did report that performance expectations (as measured by respondents' "confidence" in their ability to perform behaviours) differed, as performance expectation scores were significantly higher among men than women. Other studies among the general population also report gender differences, and results suggest that men have a stronger sense of self-efficacy than women (McAuley, Courneya, & Lettunich, 1991; Netz & Raviv, 2004).

Surprisingly, our study did not show any differences between men and women when testing the relationship between LTPA and social support. Literature from the general population has reported that men and women differ on social support for physical activity behaviour, suggesting women place a greater value on social influence/environment than men (Treiber et al., 1991; Troped & Saunders, 1998). Additionally, several studies have suggested that the source of support may differ between men and women; however, this was not measured in our study (Booth et al., 1997; Oka et al., 1995; Wallace et al., 2000).

Although social support for physical activity has not been examined across gender among people with diabetes, social support for other diabetes self-care behaviours suggests that social support may function differently among men and women with diabetes. For example, Kaplan and Hartwell (1987) examined patients with type 2 diabetes who were advised to follow a complex self-care regimen of diet and exercise. Upon 18-month follow-up it was reported that satisfaction with supportive relationships was positively associated with glycemic control of diabetes for women, however, it was negatively associated among men. Conversely, Eriksson and Rosenqvist (1993) revealed that social support was more influential on glycemic control for men, as those men with high social support had better blood glucose levels than women with high social support ($p<0.01$). Hence for future studies, items on social support scales should include questions regarding source of support (i.e. friends, family) and type of support (instrumental, informational, motivational, companionship).

The only significant differences between correlation coefficients between men and women in this study was that men demonstrated a stronger positive relationship for LTPA with confidence to do activity when the weather is bad, and when they have to let others know they have diabetes. The weaker association among women for LTPA and these items may be due to the fact that women often mention bad weather (Speck & Harrell, 2003), and social anxiety and self-consciousness as barriers to physical activity (Marcus & Forsyth, 1998).

Several patterns did emerge when examining SCT constructs and items across income and education groups. First, correlation coefficients for LTPA and the self-efficacy construct significantly differed between all income groups, with the strongest positive associations for those of high income and the weakest positive association for those of low income. Moreover, significant income group differences existed on several items on the self-efficacy scale. Clark and Nothwehr's (1999) study of self-efficacy among older adults reported that income was positively associated with exercise self-efficacy scores. Therefore, this relationship between self-efficacy and SES may be partially explained by the suggestion that self-efficacy is a product of life experiences and successes (Bandura, 1986; Clark, 1995, 1996). For example, those with higher levels of income have most likely experienced greater socially recognized success, thus affecting their confidence to engage in certain behaviours such as physical activity (Clark, 1995). Moreover, increased levels of income may affect one's resources to carry out the behaviour, ultimately influencing situation-specific self-efficacy (Clark, 1995; Grembowski et al., 1993)

With regard to outcome expectations, a trend was observed that those with higher incomes demonstrated stronger associations between LTPA and positive and negative outcome expectations. Specifically at the item-level, the major difference between all income groups was with regard to the positive anticipated outcome that physical activity would help reduce/manage stress. Burton, Turrell, and Oldenburg (2003) qualitative study explored how influences on recreational physical activity differed by SES position (high, medium and low). Similar to our findings, their study reported that "emotional benefits" (i.e., stress management) were more salient among high and medium, than low SES groups.

Notwithstanding, a reverse trend was found for education on positive outcome expectations, where LTPA was more positively associated with positive outcome expectations for those with lower levels of education (i.e. did not complete high school) than those with high levels (university/college degree). The literature suggests that positive outcome expectations are influenced by awareness, knowledge and experience of the benefits of physical activity, derived from performance accomplishments, vicarious experiences, verbal persuasion and physiological indicators (Allen, 2004). Moreover, some people make the assumption that individuals who are more highly educated would have more knowledge and awareness about the benefits of physical activity. The finding from the present study, however, suggests that: 1) people who are more highly educated do not necessarily have more knowledge or awareness about the benefits of physical activity than those less educated, or 2) if highly educated individuals have similar or more knowledge and experience about the perceived benefits of physical activity than those of lower educational levels, their physical activity behaviours are less influenced by these perceived benefits. Prior studies have, in fact, reported a lack of direct association between physical activity knowledge and minutes of physical activity per week (Hays & Clark, 1999).

When income and education were examined separately for men and women, men followed similar trends as those found within the entire sample, as discussed above. Conversely, no differences were reported across income or education groups for LTPA and self-efficacy, social support and outcome expectation constructs among women. A possible explanation for lack of differences across socioeconomic groups for women may be in the actual assessment of physical activity behaviour. For example, it is suggested that many of the activities typically performed by women have been overlooked in traditional academic assessments of physical activity (Jacobs, 2000). Further, research has shown that the relationship between SES and physical activity may differ between men and women based upon the type of activity assessed (Cauley et al., 1991; Eyler, 2003). Therefore, differences in correlation coefficients for LTPA and SCT constructs between women of varying SES may exist; however a more sensitive measure of physical activity behaviour, perhaps one that that includes mild LTPA, may be required specifically for women.

Notwithstanding, at the item-belief level, two differences for women were observed. First, women of higher education exhibited a stronger positive relationship for LTPA and confidence to do activity when the weather is bad, than women of lower education. This may be related to the fact that women of higher education typically have a higher income from their occupation (Statistics Canada, 2001b), once again affecting their access to and availability of facilities and home equipment. Subsequently, women of higher education may have more confidence when the weather is bad because they have alternative arrangements for physical activity when it is raining or snowing.

Further, those with a university/college degree demonstrated a stronger inverse association than those with a high school degree for LTPA with the belief that physical activity would take too much time. One plausible explanation for this finding may be that once again, women with higher education usually demonstrate higher earnings (Statistics Canada, 2001b), thus affecting their availability of resources such as like child care and housework. This, in turn, may translate into greater perceptions of available time to participate in leisure-time physical activity.

In summary, our study demonstrated that some differences did exist for demographic groups on physical activity behaviour, types of leisure and non-leisure activities, and the relationship between LTPA and SCT constructs and items. Notwithstanding, when interpreting significant differences in relationships between LTPA and SCT constructs/items within demographic groups, it is important to consider that some findings may have resulted from confounding factors. Two variables are confounded when their effect on the dependent variable cannot be distinguished from one another (Bauman, Sallis, Dzewaltowski, & Owen, 2002; Peck, Olsen, & Devore, 2001). As discussed in the above paragraphs, it is speculated that differences in correlations within education groups among women may be related to the fact that women of higher education typically earn higher incomes. Therefore the relationship between LTPA and SCT constructs may be affected by one's level of education, but education may be confounded with income. Similarly, Table 3 examines socio-demographic characteristics of the three education groups and reports that in addition to income, ethnicity, employment and physical activity significantly differ, which may act as other confounding factors for education group differences. Other potential confounded variables for gender (Table 1) and income groups (Table 2) are displayed so that the reader can interpret the results for themselves.

Various statistical techniques can be applied to deal with these confounded variables (e.g., holding them as constant), therefore controlling for their effects (Peck et al., 2001). These procedures were not completed by the researcher, thus it is a limitation of the present study.

3.10 Limitations

There were a number of other limitations inherent to this study. The first limitation involves the income cutpoints used for analyses. The National Council of Welfare (2004) defines its income cutpoints in dollars based on: i) size of family unit, and ii) community size. For our analysis the researcher did not have this information, thus dollar amounts were used as rough estimates for income cutpoints in the present study. Consequently, caution is warranted when interpreting the results of the income analyses.

A second limitation involves measurement of physical activity behaviour. This study employed self-report physical activity measures. Self-report measures do have an advantage because of the ability to collect data from a large amount of people at a relatively low-cost (Sallis & Saelens, 2000). However, self-report measures have also been criticized due to social desirability bias, which can lead to over-reporting of physical activity (Sallis & Saelens, 2000). Further, when examining ANOVA results in this study, gender and income differences were deemed statistically significant, however, effect size was small. Hence, findings should be interpreted cautiously.

Another limitation was the use of chosen social-cognitive measures among this population. Measures for self-efficacy and social support were originally designed for the general population, with additional items added specifically for people with diabetes. Hence, these measures have not been tested exhaustively among people with type 2 diabetes. This makes it difficult to assess the true reliability and validity of these measures among this target population. Moreover, pros and cons from the Transtheoretical Model were used as proxy measures of positive and negative outcome expectations. Consequently, the validity of results with regard to outcome expectations should be taken with caution.

Finally, this study was cross-sectional in nature, thus causal relationships cannot be implied by this correlational data. Future research should be longitudinal in design so that the predictive ability of SCT constructs for physical activity behaviour can be explored. Finally, the current study may have been improved by applying a multivariate approach. Multivariate analyses provide a stronger test (than bivariate correlations) for examining the relationships between two or more independent factors with the dependent variable (e.g., physical activity). A multivariate approach of the data-set however, was beyond the scope of the present study.

3.11 Implications for Future Research

The results of our study suggest several implications for future research. First, more sensitive measures of physical activity for women need to be developed, which reflect their meanings of physical activity (Jacobs, 2000). Further, respondents and investigators must share an understanding of terms such as “leisure-time” and “moderate” activity, which can often be interpreted with ambiguity (Sallis & Saelens, 2000). This may hold especially true for developing and measuring physical activity behaviours among individuals of varying SES. More research is therefore needed to understand demographic differences in how certain populations react and respond to assessment methodologies (Sallis & Saelens, 2000). Specifically for people of lower income and education, researchers must be aware and sensitive to how questions are worded and comprehended.

Second, the use of more objective measures of physical activity, such as pedometers and accelerometers, may help to distinguish whether true differences in physical activity behaviours exist between certain demographic groups. For example, pedometers are inexpensive and unobtrusive devices for measuring walking, and also provide immediate feedback, which can act as a great tool for motivation (Norman & Mills, 2004; Tudor-Locke, Bell, & Myers, 2000). Pedometers may prove especially useful for accurately assessing physical activity levels for people with diabetes, women and individuals of lower SES, as it has been suggested that these groups prefer walking more than other activities (Eyler et al., 2003; Ford & Herman, 1995; Wanko et al., 2004).

Third, the fact that levels of physical activity behaviour differed between gender, but few differences were seen among SCT constructs and items suggests that other psychosocial influences not measured in this study may exist. Future research needs to assess additional SCT variables associated with physical activity (i.e. situation, self-control, reinforcements etc.). Further, it is suggested that current social-cognitive theoretical frameworks only explain 30% of physical activity behaviour (Baranowski, Anderson, & Carmack, 1998). Therefore, taking a broader "ecological" approach may prove useful for understanding and predicting environmental determinants of physical activity behaviour among this population. For example, exploring environmental-policy variables including population density, connectedness, land use and proximity are important for understanding people's walking behaviours (Saelens, Sallis, & Frank, 2003).

Our research also demonstrated that several item-beliefs have an association with physical activity behaviour, and this association significantly differed within certain demographic groups even when no differences were found for that construct. Traditional scale aggregation holds an underlying belief that targeting a unidimensional construct will result in changes for single items (Rhodes et al., 2004). However, recent research suggests that each item-belief has an independent influence on behaviour, thus "changes in beliefs should precede changes in higher-order construct" (Rhodes et al., 2004, p.393). More research is therefore needed to assess the multidimensionality of constructs, and specifically the relationship between items-beliefs and physical activity behaviour. Ultimately this may effect how researchers study behaviour and design interventions.

Finally, our study suggests that greater research is necessary to examine the validity and reliability of SCT constructs and items specifically among people with diabetes. Moreover, these constructs and items need to be examined longitudinally within intervention studies. For example, many studies operationalize social-cognitive constructs as part of a physical activity intervention; however, these constructs are not assessed pre- and post- intervention. Consequently, if physical activity behaviour change occurs it is difficult to draw conclusions as to whether these social-cognitive influences mediated the behaviour change.

3.12 Implications for Practice and Policy

Walking was the most frequently reported physical activity behaviour in this study, and there were no significant differences across gender, income and education. This has great implications for designing physical activity interventions because walking is accessible, low-cost, safe, does not require any specialized equipment and can be applicable to any age group, ability and fitness level (Hu, 2003; Norman & Mills, 2004).

Moderate activity, such as walking, may also result in higher adherence rates than high intensity activity (Lombard, Lombard, & Winett, 1995), a finding that is particularly relevant to groups typically more inactive, such as women and individuals of lower SES (Eyler et al., 2003). Further, walking can be easily incorporated into daily life and it can integrate many social-cognitive influences important for lifestyle behaviour change, such as goal setting, building self-efficacy through goal attainment and continual feedback (Norman & Mills, 2004).

Walking may be especially relevant for people with diabetes because of its physical and mental health benefits. Large-scale walking programs are already being applied nation-wide with campaigns such as "Canada on the Move" (Plotnikoff et al., in press). Yet, more environmental and policy changes are required to enhance participation in walking. Providing safe walking trails, zoning and land use, mall walking programs and incentives are only some examples of how to maximize people's engagement in walking. For example, as one community-based intervention study showed, 55% of people surveyed reported increasing their walking since using newly developed trails (Brownson et al., 2000). Further, women and persons of lower SES were more likely to describe an increase in walking since using the trails.

Hence, community-based walking programs may be a beneficial way to increase walking not only for those with diabetes but for other individuals who are sedentary and at risk. The Stockholm Diabetes Prevention Program (SDPP) walking campaign, for example, focused on promoting walking through local media and volunteer-lead weekly walking groups (Bjaras, Harberg, Sydhoff, & Ostenson, 2001). Although many of those who participated were already active, one-third of participants had never exercised regularly, an important finding for having a population impact.

Nevertheless, walking interventions should be grounded in behaviour change theory. The "First Step Program" operationalized self-efficacy, outcome expectations and self-monitoring with the goal of increasing physical activity in people with type 2 diabetes (Tudor-Locke et al., 2004). Upon completion of the intervention, a profound increase in daily walking was found in the intervention group relative to the control group ($p<0.0001$). In the "Wheeling Walks" campaign, Theory of Planned Behaviour and Transtheoretical Model constructs were used to promote 30 minutes of daily walking through social marketing tools and community participation (Reger et al., 2002). Results of paid media and public health activities resulted in a 23% increase in number of walkers in the intervention community, and an increase in positive stage of change. Consequently, these studies show that walking programs grounded in behaviour change theory are practical and feasible to promote walking in a sedentary and largely overweight/obese population.

In addition to the behavioural differences discussed above, this study also examined whether the strength of association between LTPA and SCT constructs/items significantly differed within demographic groups. Essentially, this study examined whether gender, income and education moderated the relationship between LTPA and SCT constructs/items (although moderating analyses per se was not conducted) (Baron & Kenny, 1986). A moderator is a variable that may affect the direction and/or strength of a relationship between a dependent variable (LTPA) and independent (SCT construct/item) variable (Baron & Kenny, 1986; Bauman et al. 2002). In the physical activity domain, it is important to understand moderators so that interventions can be tailored to population subgroups (Bauman et al., 2002).

When exploring the relationship between LTPA and SCT constructs/items within gender and education groups, very few significant differences were noted. These results therefore suggest that for the most part, physical activity interventions do not need to be separately tailored for men and women, and individuals of varying education levels. However, more research is needed to validate these findings and to explore potential differences in the relationship between LTPA and additional SCT constructs not assessed in this study.

Notwithstanding, the present study did indicate differences within income groups for the association between LTPA and SCT constructs/items. For example, individuals of higher income demonstrated a stronger relationship between LTPA, and self-efficacy and outcome expectations, than individuals of lower income. As such, practitioners should target high income individuals with tailored self-efficacy and outcome expectations messages, because this group will most likely gain the greatest benefit from operationalizing these constructs and items in physical activity interventions. Improving self-efficacy and outcome expectations can be accomplished through four mechanisms, including performance accomplishments, vicarious experience, verbal persuasion and physiological states (Marcus, King, Clark, Pinto, & Bock, 1996).

Specifically, operationalizing vicarious experience and verbal persuasion may prove useful. This can be achieved through the use of appropriate role models that mirror characteristics of this demographic group could help to build confidence if participants see and hear stories of their physical activity endeavours. These role models could be promoted through the media, or by drawing upon local leaders and resources within the community. Further, teaching stress management techniques so that participants can alter mood states or even increasing awareness regarding the stress-reducing effects of physical activity may help participants increase their confidence to engage in physical activity.

Conversely self-efficacy and outcome expectations demonstrated a weaker association with LTPA for individuals of lower income. This suggests that these particular SCT constructs may not be as influential for physical activity behaviour among lower income individuals. As a result, SCT constructs not measured in this study such as environment, situation, observational learning, self-control and reinforcement, need to be assessed in order to identify potentially salient constructs among this demographic groups. Moreover, the present findings suggest that several *items* within self-efficacy and outcome expectations scales may not be relevant for physical activity behaviour among those of lower income. These findings may therefore be useful to guide item and scale development for future study questionnaires.

Further, the present findings also suggest that assessing constructs and items from other theories may prove worthy of study. This may include theories and models at the personal-level, but also exploring macro-level perspectives (King, Stockols, Talen, Brassington, & Killingsworth, 2002). For example, the use of the social-ecological model, which examines the interaction of intrapersonal, interpersonal, organizational, environmental and policy influences on behaviour, may offer promise for explaining physical activity behaviour and designing future physical activity interventions.

Integrating theory and concepts across disciplines to create a transdisciplinary model of physical activity promotion may also be warranted (King et al., 2002).

3.13 Conclusion

Physical activity is one of the cornerstones of effective management for people with type 2 diabetes. Although this study was exploratory in nature, it suggests that the physical activity behaviours may differ for certain demographic groups among people with type 2 diabetes. Further, it suggests that the SCT offers promise for understanding the relationship between physical activity and certain social-cognitive constructs and items, and for exploring potential differences across demographic groups among this population.

More research is needed to explore additional constructs within the SCT across varying demographic characteristics. Notwithstanding, preliminary research, such as this study, may help guide the design and implementation of interventions that match physical activity needs and interests among people with type 2 diabetes.

3.14 References

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Table 1: Socio-Demographic Characteristics of Study Participants – By Gender

Variable	Sample (n=1614)	Men (n=829)	Women (n=785)	p value*
	M (SD)	**M (SD)**	**M (SD)**	
Age	62.9 (12.1)	64.2 (11.4)	61.6 (12.6)	p<.001
Average Age of Diagnosis	51.8 (15.0)	52.8 (14.2)	50.6 (15.7)	p<.01
	%	%	%	
Gender				
Men	51.4	-----	-----	-----
Women	48.6			
Ethnicity				
Canadian	74.3	72.2	76.6	p>.05
Other	25.7	27.8	23.4	
Marital Status				
Currently married/partner	76.4	85.6	66.7	p<.001
Currently not married/no partner	23.6	14.1	33.3	
Education				
Not completed high school	25.0	25.7	24.2	p>.05
Completed high school degree	40.9	39.1	42.9	
Completed University/college degree	34.1	35.2	32.9	
Income				
Low Income (< $20,00)	14.1	9.9	18.7	p<.001
Middle Income ($20,000-$79,999)	68.6	67.4	70.0	
High Income (> $80,000)	17.3	22.7	11.4	
Employment				
Full-time paid	26.8	32.4	20.9	p<.001
Part-time paid	8.4	5.6	11.4	
Homemaker	9.6	1.0	18.9	
Retired and/or Volunteer	52.5	58.6	46.0	
Unemployed	2.7	2.6	2.8	
Current Smoker	7.7	8.1	7.2	p>.05
Taking insulin daily	21.6	19.5	23.7	p>.05
Taking diabetic pills daily	67.1	68.5	65.6	p>.05
Body Mass Index				
Underweight (<18.5)	0.8	0.6	1.0	p<.001
Normal (18.5-24.9)	20.2	21.2	19.1	
Overweight (25.0-29.9)	34.8	39.4	30.0	
Obese (>30)	44.2	38.8	49.9	
Physical Activity Behaviour in MET.minutes†				
Active	30.0	34.3	25.5	p<.001
Inactive	70.0	65.7	74.5	

† Defined as active or inactive based on meeting recommended guidelines of 600 MET.minutes/week of moderate and strenuous activity (Brown & Bauman, 2000).

***p-values were calculated using t-tests (continuous data) and chi-square analysis (categorical data).**

Table 2: Socio-Demographic Characteristics of Study Participants – By Income

Variable	Low Income (n=203)	Middle Income (n=991)	High Income (n=250)	p value*
	M (SD)	**M (SD)**	**M (SD)**	
Age	65.6 (12.2)	63.5 (12.1)	56.6 (10.8)	p<.001
Average Age of Diagnosis	52.9 (15.6)	52.5 (14.9)	47.4 (13.1)	p<.001
	%	%	%	
Gender				
Men	36.9	51.6	68.8	p<.001
Women	63.1	48.4	31.2	
Ethnicity				
Canadian	75.7	72.5	77.1	p>.05
Other	24.3	27.5	22.9	
Marital Status				
Currently married/partner	39.4	78.8	94.8	p<.001
Currently not married/no partner	60.6	21.2	5.2	
Education				
Not completed high school	48.0	23.0	7.6	
Completed high school	36.5	44.1	38.0	p<.001
Completed University/college	15.5	33.0	54.4	
Employment				
Full-time paid	7.0	24.8	54.4	
Part-time paid	8.0	8.6	10.5	
Homemaker	11.6	8.9	8.5	p<.001
Retired and/or Volunteer	68.3	55.5	24.2	
Unemployed	7.0	2.2	2.4	
Current Smoker	12.4	7.5	6.8	p>.05
Taking insulin daily	23.4	21.9	17.2	p>.05
Taking diabetic pills daily	72.0	65.2	70.3	p>.05
Body Mass Index				
Underweight (<18.5)	0.5	0.8	0.4	
Normal (18.5-24.9)	17.2	20.8	19.3	p>.05
Overweight (25.0-29.9)	32.3	34.0	38.6	
Obese (>30)	50.0	44.4	41.6	
Physical Activity Behaviour in MET.minutes†				
Active	20.2	29.9	42.0	p<.001
Inactive	79.8	70.1	58.0	

† Defined as active or inactive based on meeting recommended guidelines of 600 MET.minutes/week of moderate and strenuous activity (Brown & Bauman, 2000).

*p-values were calculated using ANOVAs (continuous data) and chi-square analysis (categorical data).

Table 3: Socio-Demographic Characteristics of Study Participants – By Education

Variable	Did not complete HS (n=399)	Completed HS (n=654)	Completed UC degree (n=545)	p value*
	M (SD)	**M (SD)**	**M (SD)**	
Age	66.8 (10.2)	62.7 (11.6)	60.3 (13.2)	p<.001
Average Age of Diagnosis	54.0 (15.2)	51.6 (14.6)	50.2 (14.8)	p<.01
	%	%	%	
Gender				
Men	52.9	49.1	53.0	p>.05
Women	47.1	50.9	47.0	
Ethnicity				
Canadian	81.4	72.1	72.1	p<.01
Other	18.6	27.9	27.9	
Marital Status				
Currently married/partner	75.9	76.9	76.7	p>.05
Currently not married/no partner	31.3	23.1	23.3	
Income				
Low Income (< $20,00)	28.1	12.1	6.3	
Middle Income ($20,000-$79,999)	66.4	72.2	66.1	p<.001
High Income (> $80,000)	5.6	15.7	27.6	
Employment				
Full-time paid	15.3	27.5	34.2	
Part-time paid	3.6	10.3	9.7	
Homemaker	11.5	11.2	6.6	p<.001
Retired and/or Volunteer	67.7	48.7	45.8	
Unemployed	2.0	2.3	3.7	
Current Smoker	9.1	7.5	7.0	p>.05
Taking insulin daily	22.5	22.1	20.1	p>.05
Taking diabetic pills daily	66.6	67.6	66.5	p>.05
Body Mass Index				
Underweight (<18.5)	1.3	0.8	0.6	
Normal (18.5-24.9)	19.1	19.5	22.2	p>.05
Overweight (25.0-29.9)	36.1	33.8	35.7	
Obese (>30)	43.5	45.8	41.5	
Physical Activity Behaviour in MET.minutes†				
Active	25.3	29.4	34.5	p<.01
Inactive	74.7	70.6	65.5	

† Defined as active or inactive based on meeting recommended guidelines of 600 MET.minutes/week of moderate and strenuous activity (Brown & Bauman, 2000).

HS = high school, UC = university/college.

*p-values were calculated using ANOVAs (continuous data) and chi-square analysis (categorical data).

Table 4: Calculation of Leisure-Time Physical Activity (LTPA)

LTPA = (SF x SD x SMETS) + (MF x MD x MMETS)

Where:
LTPA = Leisure-time physical activity in MET.minutes/week
SF = Strenuous Frequency (number of days per week)
SD = Strenuous Duration (amount of minutes per day)
SMETS = Strenuous MET.minutes (mean metabolic equivalent for Strenuous activity)
MF = Moderate Frequency (number of days per week)
MD = Moderate Duration (amount of minutes per day)
MMETS = Moderate MET.minutes (mean metabolic equivalent for Moderate activity)

Table 5: Physical Activity Self-Efficacy Items

In the next 6 months I am confident that I can participate in regular physical activity:
- When I am a little tired.
- When I am in a bad mood or feeling depressed.
- When I have to do it by myself.
- When it becomes boring.
- When I can't notice any improvements in my fitness.
- When I have many other demands on my time.
- When I feel a little stiff or sore.
- When the weather is bad.
- When I have to get up early, even on weekends.
- When I have diabetes complications.
- When I have to find different activities due to diabetes complications.
- When I feel a little ill.
- When I have to let others know that I have diabetes.

Table 6: Physical Activity Outcome Expectation Items

POSITIVE OUTCOME EXPECTATIONS

Over the next 6 months:

- Physical Activity would help me reduce tension or manage my stress.
- I would feel more confident about my health getting regular physical activity.
- I would sleep better.
- Physical activity would help me have a more positive outlook.
- Physical activity would help me control my weight.
- Regular physical activity would decrease my chances of having further diabetes complications.
- Regular physical activity would help control my glucose level.

NEGATIVE OUTCOME EXPECATATIONS

Over the next 6 months:

- Physical activity would take too much of my time.
- I would have less time for my family and friends if I participated in physical activity.
- I'd be too tired to get physical activity because of my other daily responsibilities.
- I'd worry about looking awkward if others saw me be physically active.
- Participating in physical activity would cost too much money.
- Regular physical activity would require that I monitor my blood glucose levels more closely.
- Regular physical activity may lead to an insulin reaction.
- Regular physical activity will require me to let others know I have diabetes.
- Regular physical activity will require me to rely on others if complications occur.
- Regular physical activity would cause me physical injury.

Table 7: Social Support Items

- People in my social network are likely to help me participate in regular physical activity.
- There is no one in my social network who I can turn to for assistance with regular physical activity.
- I feel that someone in my social network will provide the support I need in order to be regularly physically active.

Table 8: Frequency of Leisure and Non-Leisure Activities – Gender Differences

Activity	**SAMPLE** (n=1614)	**MEN** (n=829)	**WOMEN** (n=785)
Leisure-Time Activities (%)			
Walking for exercise	74.3	74.6	73.9
Stretching	31.5	27.7	35.8 **
Stair climbing	25.8	20.2	32.0 **
Jogging/Treadmill	18.6	20.2	16.9
Machine home exercises	17.5	17.1	17.9
Non-machine home exercises	16.8	15.5	18.2
Weight lifting	16.1	19.3	12.5 **
Gardening	13.9	15.2	12.5
Aerobics classes	10.0	6.2	14.1 **
Dancing	7.0	5.9	8.3
Bowling	6.0	6.3	5.7
Swimming	5.9	4.7	7.2
Cycling	5.0	6.1	3.8
Yoga/Tai chi	3.4	1.3	5.7 **
Golf	3.3	4.5	2.0 *
Non-leisure Activities (%)			
Household chores	77.4	66.7	89.3 **
Yardwork/shoveling snow	47.1	57.7	35.4 **
Walking at work	25.7	29.9	21.1 **
Playing with children	15.1	12.3	18.1 **
Move heavy objects at work	13.1	17.2	8.6 **

Groups significantly differ at *p<.05, **p<.01

Table 9: Frequency of Leisure and Non-Leisure Activities – Differences Across Income

Activity	SAMPLE			MEN			WOMEN		
	Low (n=203)	Middle (n=991)	High (n=250)	Low (n=75)	Middle (n=511)	High (n=172)	Low (n=128)	Middle (n=480)	High (n=78)
Leisure-Time Activities (%)									
Walking for exercise	80.5	74.5	69.9	81.8	74.4	73.2	79.8	74.6	63.3
Stretching	33.8	31.8	29.8	22.2	29.7	21.2	40.9	34.1	32.2
Stair climbing	33.1	25.2	17.7 **	27.8	21.7	14.8	36.4	29.2	23.7
Jogging/Treadmill	10.1	18.1	27.9 **	12.7	18.2	30.9 **	8.5	17.9	21.7 *
Machine home exercises	11.3	18.8	15.9	7.4	17.9	17.1	13.6	19.8	13.6
Non-machine home exercises	25.4	16.1	14.3 *	20.4	15.6	15.4	28.4	16.6	11.9 *
Weight lifting	14.1	14.5	27.6 **	13.0	17.9	31.1 **	14.8	10.6	20.3
Gardening	13.4	14.1	12.7	16.7	15.1	14.8	11.4	12.9	8.5
Aerobics classes	12.1	9.6	10.4	3.6	6.7	6.5	17.0	12.8	18.3
Dancing	9.4	6.2	6.6	9.1	4.7	6.6	9.6	8.0	6.7
Bowling	4.9	5.6	5.5	9.3	5.5	4.9	2.3	5.7	6.8
Swimming	4.9	6.2	4.9	3.7	5.5	3.3	5.7	6.9	8.5
Cycling	2.8	5.2	6.6	0.0	6.5	8.1	4.5	3.7	3.4
Yoga/Tai chi	4.2	3.4	3.9	0.0	1.5	1.6	6.8	5.4	8.5
Golf	1.4	3.4	3.3	3.7	4.3	4.9	0.0	2.3	0.0
Non-leisure Activities (%)									
Household chores	83.9	77.3	69.8 **	72.7	66.9	60.7	90.4	89.2	88.3
Yardwork/shoveling snow	38.9	47.9	53.8 *	47.3	58.0	64.8	34.0	36.5	31.7
Walking at work	16.2	26.3	35.9 **	27.8	28.5	38.5	9.1	23.8	30.5 **
Playing with children	20.1	12.5	22.5 **	21.8	9.5	18.0 **	19.1	16.0	31.7 *
Move heavy objects at work	7.0	14.1	14.9	14.8	18.1	16.4	2.3	9.5	11.9

Groups significantly differ at *p<.05, **p<.01

Table 10: Frequency of Leisure and Non-Leisure Activities – Differences Across Education

Activity	SAMPLE			MEN			WOMEN		
	<HS (n=399)	HS Degree (n=654)	UC Degree (n=545)	<HS (n=211)	HS (n=321)	UC (n=289)	<HS (n=188)	HS (n=333)	UC (n=256)
Leisure-Time Activities (%)									
Walking for exercise	72.7	74.2	75.6	73.1	74.6	75.9	72.2	73.9	75.1
Stretching	26.2	33.1	32.8	22.4	31.4	27.1	30.9	34.7	39.7
Stair climbing	30.5	23.6	25.4	25.6	16.9	20.4	36.6	29.8	31.5
Jogging/Treadmill	16.7	17.0	21.0	18.6	19.2	22.3	14.3	15.0	19.5
Machine home exercises	17.2	17.4	17.5	14.1	17.4	18.0	21.1	17.3	16.8
Non-machine home exercises	16.1	16.9	16.7	14.1	16.9	14.4	18.7	16.9	19.6
Weight lifting	11.5	14.9	19.8 *	12.8	19.5	22.6	9.8	10.5	16.3
Gardening	10.4	13.4	16.5	11.5	14.8	18.1	8.9	12.1	14.7
Aerobics classes	7.1	10.5	11.5	4.5	7.9	5.8	10.3	13.0	18.4
Dancing	7.4	6.7	7.1	5.1	5.4	6.7	10.3	7.9	15.4
Bowling	7.9	5.8	4.9	9.0	5.9	4.5	6.5	5.6	5.4
Swimming	3.9	7.2	5.7	3.8	5.1	5.0	4.1	9.3	6.5
Cycling	3.6	5.6	5.4	5.1	7.6	5.4	1.6	3.6	5.4
Yoga/Tai chi	1.8	3.3	4.7	0.0	0.8	1.3	4.1	5.6	7.1
Golf	2.9	3.3	3.5	5.1	5.1	3.6	0.0	1.6	3.3
Non-leisure Activities (%)									
Household chores	76.2	75.7	80.4	65.4	64.2	70.4	89.7	86.6	92.4
Yardwork/shoveling snow	49.6	44.8	47.8	63.5	58.8	52.9	32.5	31.6	41.6
Walking at work	18.6	26.7	29.4 **	25.6	33.1	29.0	9.8	20.6	29.9 **
Playing with children	13.5	13.4	18.4	12.2	9.6	15.2	15.1	17.0	22.2
Move heavy objects at work	11.5	13.6	13.6	17.3	18.6	15.4	4.1	8.9	8.6

Education Groups include: i) < HS (did not complete high school), ii) HS (completed high school), iii) UC (completed a university/college degree).
Groups significantly differ at *$p<.05$, **$p<.01$

Table 11: Correlations and Observed Values of Z for SCT Constructs and LTPA - Across Gender, Income and Education

	Self-Efficacy	Social Support	Positive Outcome Expectations	Negative Outcome Expectations
Gender				
Men	.44	.08	.23	-.14
Women	.38	.15	.20	-.13
z obs value	1.45	1.42	.63	-.20
Income				
Low	.28	.09	.09	-.04
Middle	.42	.13	.18	-.19
Z score	2.06*	.52	1.18	-1.95
Low	.28	.09	.09	-.04
High	.55	.04	.29	-.24
z obs value	3.48**	.53	2.19*	-2.15*
Middle	.42	.13	.18	-.19
High	.55	.04	.29	-.24
z obs value	2.40*	1.28	1.64	-0.74
Education				
< HS	.40	.09	.27	-.12
HS	.43	.11	.22	-.16
z obs value	.57	.32	.84	- .64
< HS	.40	.09	.27	-.12
UC	.43	.11	.13	-.17
z obs value	.55	.31	2.21*	- .77
HS	.43	.11	.22	-.16
UC	.43	.11	.13	-.17
z obs value	.00	.00	1.60	- .18

Education Groups include: i) < HS (did not complete high school), ii) HS (completed high school), iii) UC (completed a university/college degree).
Groups significantly differ at *p<.05, **p<.01

Table 12: Correlations & Observed Values of Z for Self-Efficacy Items & LTPA - Across Gender, Income & Education

	I am confident that I can participate in physical activity when:												
	Tired	I'm in a bad mood	I have to do it by myself	It is boring	I can't notice improvements	I have other demands on time	I feel stiff/sore	The weather is bad	I have to get up early	I have diabetes complications	I have to find different activity	I feel ill	I have to let others about diabetes
						Gender							
Men	.43	.39	.37	.38	.39	.36	.39	.38	.36	.32	.31	.35	.30
Women	.37	.32	.29	.31	.33	.35	.36	.28	.29	.25	.22	.32	.19
z obs value	1.42	1.58	1.78	1.56	1.36	.23	.69	2.22*	1.54	1.48	1.89	.67	2.31*
						Income							
Low	.28	.18	.26	.23	.27	.24	.21	.28	.23	.21	.17	.24	.12
Mid	.40	.36	.35	.35	.37	.35	.38	.33	.37	.30	.29	.34	.28
z obs value	1.73	2.47*	1.26	1.65	1.40	1.53	2.39*	.70	1.94	1.21	1.56	1.39	2.11*
Low	.28	.18	.26	.23	.27	.24	.21	.28	.23	.21	.17	.24	.20
High	.50	.47	.40	.46	.45	.51	.51	.40	.32	.34	.38	.48	.33
z obs value	2.72**	3.40**	1.64	2.72**	2.15*	3.31**	3.65**	1.41	1.00	1.45	2.33*	2.90**	2.30*
Mid	.40	.36	.35	.35	.37	.35	.38	.33	.37	.30	.29	.34	.28
High	.50	.47	.40	.46	.45	.51	.51	.40	.32	.34	.38	.48	.33
z obs value	1.76	1.86	.81	1.84	1.34	2.76**	2.28*	1.13	.79	.61	1.39	2.36*	.77
						Education							
< HS	.42	.37	.33	.35	.33	.34	.37	.34	.31	.30	.24	.35	.26
HS	.41	.34	.35	.37	.39	.37	.40	.32	.38	.30	.31	.35	.26
z obs value	.19	.53	.35	.36	1.05	.53	.54	.35	1.22	.00	1.13	.00	.00
< HS	.42	.37	.33	.35	.33	.34	.37	.34	.31	.30	.24	.35	.26
UC	.40	.37	.35	.34	.37	.36	.36	.38	.32	.29	.27	.33	.25
z obs value	.36	.00	.34	.17	.67	.34	.17	.68	.16	.16	.46	.34	.16
HS	.41	.34	.35	.37	.39	.37	.40	.32	.38	.30	.31	.35	.26
UC	.40	.37	.35	.34	.37	.36	.36	.38	.32	.29	.27	.33	.25
z obs value	.20	.59	.00	.58	.40	.20	.80	1.17	1.16	.18	.73	.40	.18

Education Groups: i) < HS (did not complete high school), ii) HS (completed high school), iii) UC (completed a university/college degree). Groups significantly differ at *p<.05, **p<.01

Table 13: Correlations & Observed Values of Z for Outcome Expectations Items & LTPA - Across Gender, Income & Education

	POSITIVE OUTCOME EXPECTATIONS							NEGATIVE OUTCOME EXPECTATIONS							
	Physical Activity would help me:							*Physical Activity would:*							
	Re-duce tension / stress	Feel more con-fident about my health	Sleep better	Have a more positive outlook	Control my weight	Decrease my chances of having compli-cations	Control my glucose level	Take too much time	Lead to less time for family and friends	Make me tired	Make me worry about looking awkward in front of others	Cost too much money	Require that I monitor my blood glucose levels more closely	Require me to rely on others if compli-cations occur	Cause me physical injury
Gender															
Men	.21	.21	.22	.18	.15	.12	.22	-.13	-.07	-.15	-.10	-.10	-.06	-.08	-.12
Women	.18	.20	.17	.16	.09	.11	.16	-.05	-.08	-.19	-.11	-.13	-.04	-.05	-.08
z obs value	.62	.21	1.03	.41	1.21	.20	1.24	-.92	-.20	-.82	-.20	-.60	-.40	-.60	-.80
Income															
Low	-.02	.11	.03	.16	.12	-.01	.13	-.08	-.05	-.06	-.05	-.03	-.03	-.10	-.05
Mid	.17	.19	.19	.11	.12	.09	.16	-.13	-.09	-.20	-.14	-.14	-.06	-.09	-.13
z obs value	2.45*	1.05	2.06*	.65	.00	1.15	.39	-.64	-.51	-1.82	-1.16	-1.41	-.38	-.13	-1.02
Low	-.02	.11	.03	.16	.12	-.01	.13	-.08	-.05	-.06	-.05	-.03	-.03	-.10	-.05
High	.30	.22	.26	.23	.08	.18	.30	-.18	-.18	-.22	-.15	-.18	-.08	-.08	-.18
z obs value	3.44**	1.18	2.44*	.76	.42	2.00*	1.86	-1.06	-1.37	-1.70	-1.05	-1.58	-.52	-.21	-1.37
Mid	.17	.19	.18	.11	.12	.09	.16	-.13	-.09	-.20	-.14	-.14	-.06	-.09	-.13
High	.30	.22	.26	.23	.08	.18	.30	-.18	-.18	-.22	-.15	-.18	-.08	-.08	-.18
z obs value	1.92	.44	1.03	1.73	.57	1.28	2.07*	-.72	-1.28	-.29	-.14	-.57	-.28	-.14	-.72
Education															
< HS	.24	.25	.25	.21	.14	.15	.21	-.06	-.07	-.18	.00	-.08	-.07	-.13	-.11
HS	.19	.22	.18	.16	.15	.12	.18	-.11	-.10	-.16	-.16	-.16	-.06	-.07	-.09
z obs value	.81	.49	1.14	.80	.16	.47	.48	-.77	-.47	-.32	-2.50*	-1.26	-.16	-.94	-.31
< HS	.24	.25	.25	.21	.14	.15	.21	-.06	-.07	-.18	.00	-.08	-.07	-.13	-.11
UC	.12	.13	.14	.12	.06	.06	.16	-.13	-.07	-.17	-.16	-.13	-.05	-.04	-.13
z obs value	1.85	1.86	1.71	1.38	1.21	1.36	.78	-1.05	.00	-.15	-2.42*	-.76	-.30	-1.35	-.30
HS	.19	.22	.18	.16	.15	.12	.18	-.11	-.10	-.16	-.16	-.16	-.06	-.06	-.09
UC	.12	.13	.14	.12	.06	.06	.16	-.13	-.07	-.17	-.16	-.13	-.05	-.04	-.13
z obs value	1.23	1.59	.70	.70	1.56	1.04	.35	-.35	-.52	-.18	.00	-.52	-.17	-.51	-.69

Education Groups include: i) < HS (did not complete high school), ii) HS (completed high school), iii) UC (completed a university/college degree). Groups significantly differ at *p<.05, **p<.01

Table 14: Correlations & Observed Values of Z for SCT Constructs & LTPA - Men & Women Across Income & Education

	MEN (n=829)				WOMEN (n=785)			
	Self-Efficacy	Social Support	Positive Outcome Expectations	Negative Outcome Expectations	Self-Efficacy	Social Support	Positive Outcome Expectations	Negative Outcome Expectations
Income								
Low	.19	-.04	.04	-.02	.35	.17	.13	-.06
Middle	.44	.11	.20	-.19	.39	.18	.21	-.15
z obs value	2.20*	1.19	1.29	-1.37	.46	.10	.82	-.91
Low	.19	-.04	.04	-.02	.35	.17	.13	-.06
High	.60	.04	.32	-.23	.41	.04	.23	-.23
z obs value	3.56**	.57	2.07*	-1.52	.48	.90	.71	-1.19
Middle	.44	.11	.20	-.19	.39	.18	.21	-.15
High	.60	.04	.32	-.23	.41	.04	.23	-.23
z obs value	2.49*	.79	1.45	-.47	.19	1.14	.17	-.67
Education								
< HS	.40	.05	.32	-.11	.40	.15	.22	-.13
HS	.46	.07	.28	-.17	.37	.17	.19	-.10
z obs value	.83	.23	.49	-.69	.38	.22	.34	-.33
< HS	.40	.05	.32	-.11	.40	.15	.22	-.13
UC	.44	.13	.12	-.14	.41	.13	.19	-.20
z obs value	.53	.89	2.32*	-.33	.12	.21	.32	-.74
HS	.44	.07	.28	-.17	.41	.17	.19	-.10
UC	.46	.13	.12	-.14	.37	.13	.19	-.20
z obs value	.31	.74	2.05*	-.38	.56	.49	.00	-1.23

Education Groups: i) < HS (did not complete high school), ii) HS (completed high school), iii) UC (completed a university/college degree).
Groups significantly differ at *$p<.05$, **$p<.01$

Table 15: Correlations & Observed Values of Z for Self-Efficacy Items & LTPA - Men, Across Income & Education

	MEN **(n=829)**												
	I am confident that I can participate in physical activity when:												
	Tired	I'm in a bad mood	I have to do it by myself	It is boring	I can't notice improvements	I have other demands on time	I feel stiff/sore	The weather is bad	I have to get up early	I have diabetes complications	I have to find different activity	I feel ill	I have to let others about diabetes
Income													
Low	.21	.06	.14	.15	.18	.10	.14	.23	.24	.17	.12	.16	.13
Mid	.41	.39	.39	.38	.40	.35	.38	.37	.38	.32	.32	.35	.29
z obs value	1.60	2.74**	2.11*	1.86	1.87	2.08*	2.03*	1.19	1.21	1.24	1.61	1.59	1.30
Low	.21	.06	.14	.15	.18	.10	.14	.23	.24	.17	.12	.16	.13
High	.54	.54	.42	.48	.48	.51	.52	.47	.35	.37	.41	.49	.42
z obs value	2.75**	3.81**	2.15*	2.60**	2.37*	3.25**	3.06**	1.92	.84	1.51	2.15*	2.62**	2.20*
Mid	.41	.39	.39	.38	.40	.35	.38	.37	.38	.32	.32	.35	.29
High	.54	.54	.42	.48	.48	.51	.52	.47	.35	.37	.41	.49	.42
z obs value	1.89	2.16*	.40	1.37	1.11	2.21*	1.97*	1.36	.39	.63	1.14	1.91	1.66
Education													
< HS	.43	.38	.33	.39	.35	.32	.36	.34	.34	.29	.25	.34	.30
HS	.44	.38	.40	.40	.44	.39	.41	.40	.43	.34	.37	.38	.34
z obs value	.14	.00	.89	.13	1.17	.88	.65	.77	1.16	.60	1.43	.51	.49
< HS	.43	.38	.33	.39	.35	.32	.36	.34	.34	.29	.25	.34	.30
UC	.41	.40	.36	.35	.36	.34	.37	.38	.30	.32	.28	.31	.26
z obs value	.26	.25	.37	.50	.12	.24	.12	.50	.48	.35	.34	.36	.46
HS	.44	.38	.40	.40	.44	.39	.41	.40	.43	.34	.37	.38	.34
UC	.41	.40	.36	.35	.36	.34	.37	.38	.30	.32	.28	.31	.26
z obs value	.45	.29	.57	.71	1.16	.70	.57	.29	1.82	.27	1.20	.97	1.06

Education Groups: i) < HS (did not complete high school), ii) HS (completed high school), iii) UC (completed a university/college degree). Groups significantly differ at *p<.05, **p<.01

Table 16: Correlations & Observed Values of Z for Outcome Expectations Items & LTPA - Men, Across Income & Education

	MEN (n=829)													
	POSITIVE OUTCOME EXPECTATIONS							**NEGATIVE OUTCOME EXPECTATIONS**						
	Physical Activity would help me:							*Physical Activity would:*						
	Reduce tension / stress	Feel more con-fident about my health	Sleep better	Have a more positive outlook	Control my weight	Decrease my chances of having compli-cations	Control my glucose level	Take too much time	Lead to less time for family and friends	Make me tired	Make me worry about looking awk-ward in front of others	Cost too much money	Require that I monitor my blood glucose levels more closely	Require me to rely on others if compli-cations occur	Cause me physical injury
Income														
Low	-.14	.05	-.07	.12	.18	-.02	.13	-.04	-.03	-.05	-.06	.04	.00	-.09	-.01
Mid	.18	.20	.22	.13	.16	.06	.17	-.14	-.09	-.18	-.11	-.13	-.07	-10	-.15
z obs value	2.53*	1.20	2.27*	.08	.16	.62	.32	-.79	-.47	-1.03	-.39	-1.33	-.54	-.08	-1.11
Low	-.14	.05	-.07	.12	.18	-.02	.13	-.04	-.03	-.05	-.06	.04	.00	-.09	-.01
High	.35	.22	.27	.26	.10	.21	.33	-.26	-.15	-.21	-.15	-.18	-.06	-.02	-.18
z obs value	3.55**	1.22	2.41*	1.02	.57	1.63	1.50	-1.58	-.85	-1.14	-.64	-1.55	-.42	-.49	-1.21
Mid	.18	.20	.22	.13	.16	.06	.17	-.14	-.09	-.18	-.11	-.13	-.07	-10	-.15
High	.35	.22	.27	.26	.10	.21	.33	-.26	-.15	-.21	-.15	-.18	-.06	-.02	-.18
z obs value	2.05*	.23	.59	1.51	.68	1.72	1.92	-1.40	-.68	-.35	-.46	-.57	-.11	-.90	-.35
Education														
< HS	.33	.29	.31	.24	.17	.18	.24	-.05	-.07	-.16	.04	.00	-.06	-.16	-.07
HS	.21	.26	.23	.20	.23	.16	.24	-.22	-.14	-.18	-.15	-.12	-.05	-.07	-.15
z obs value	1.43	.36	.95	.58	.69	.23	.00	-1.90	-.78	-.23	-2.11*	-1.33	-.11	-1.01	-.90
< HS	.33	.29	.31	.24	.17	.18	.24	-.05	-.07	-.16	.04	.00	-.06	-.16	-.07
UC	.11	.10	.14	.13	.05	.04	.18	-.11	-.04	-.12	-.16	-.14	-.06	-.02	-.14
z obs value	2.51*	2.15*	1.93	1.23	1.32	1.54	.68	-.65	-.33	-.44	-2.19*	-1.52	.00	-1.52	-.77
HS	.21	.26	.23	.20	.23	.16	.24	-.22	-.14	-.18	-.15	-.12	-.05	-.07	-.15
UC	.11	.10	.14	.13	.05	.04	.18	-.11	-.04	-.12	-.16	-.14	-.06	-.02	-.14
z obs value	1.25	2.03*	1.14	.88	2.25*	1.49	.77	-1.38	-1.23	-.75	-.13	-.25	-.13	-.61	-.13

Education Groups: i) < HS (did not complete high school), ii) HS (completed high school), iii) UC (completed a university/college degree). Groups significantly differ at $^{*}p<.05$, $^{**}p<.01$

Table 17: Correlations & Observed Values of Z for Self-Efficacy Items & LTPA - Women, Across Income & Education

	WOMEN (n=785)												
	I am confident that I can participate in physical activity when:												
	Tired	I'm in a bad mood	I have to do it by myself	It is boring	I can't notice improve-ments	I have other demands on time	I feel stiff/sore	The weather is bad	I have to get up early	I have diabetes compli-cations	I have to find different activity	I feel ill	I have to let others about diabetes
Income													
Low	.32	.26	.33	.28	.32	.34	.27	.31	.23	.23	.21	.30	.12
Mid	.38	.34	.27	.29	.32	.34	.37	.27	.33	.25	.21	.30	.24
z obs value	.67	.86	.65	.11	.22	.00	1.10	.43	1.05	.21	.00	.00	1.21
Low	.32	.26	.33	.28	.32	.34	.27	.31	.23	.23	.21	.30	.12
High	.39	.27	.35	.39	.38	.48	.48	.19	.23	.25	.28	.43	.11
z obs value	.55	.07	.15	.84	.46	1.15	1.68	1.02	.00	.14	.50	1.02	.07
Mid	.38	.34	.27	.29	.32	.34	.37	.27	.33	.25	.21	.30	.24
High	.39	.27	.35	.39	.38	.48	.48	.19	.23	.25	.28	.43	.11
z obs value	.09	.62	.71	.91	.55	1.36	1.08	.68	.86	.00	.58	1.21	1.08
Education													
< HS	.42	.36	.32	.29	.30	.36	.37	.33	.28	.30	.24	.37	.21
HS	.36	.30	.27	.32	.32	.32	.38	.20	.27	.23	.22	.30	.15
z obs value	.76	.72	.59	.35	.23	.45	.12	1.50	.11	.79	.22	.84	.66
< HS	.42	.36	.32	.29	.30	.36	.37	.33	.28	.30	.24	.37	.21
UC	.36	.32	.32	.32	.36	.39	.34	.37	.34	.24	.21	.33	.23
z obs value	.72	.46	.00	.33	.67	.35	.35	.46	.67	.64	.31	.46	.21
HS	.36	.30	.27	.32	.32	.32	.38	.20	.27	.23	.22	.30	.15
UC	.36	.32	.32	.32	.36	.39	.34	.37	.34	.24	.21	.33	.23
z obs value	.14	.26	.65	.00	.53	.95	.55	2.20*	.91	.12	.12	.40	.98

Education Groups: i) < HS (did not complete high school), ii) HS (completed high school), iii) UC (completed a university/college degree). Groups significantly differ at $*p<.05$, $**p<.01$

Table 18: Correlations & Observed Values of Z for Outcome Expectations Items & LTPA: Women, Across Income & Education

	WOMEN (n=785)														
	POSITIVE OUTCOME EXPECTATIONS							**NEGATIVE OUTCOME EXPECTATIONS**							
	Physical Activity would help me:							*Physical Activity would:*							
	Reduce tension /stress	Feel more con-fident about my health	Sleep better	Have a more positive outlook	Control my weight	Decrease my chances of having compli-cations	Control my glucose level	Take too much time	Lead to less time for family and friends	Make me tired	Make me worry about looking awk-ward in front of others	Cost too much money	Require that I monitor my blood glucose levels more closely	Require me to rely on others if compli-cations occur	Cause me physica l injury
Income															
Low	.06	.15	.09	.18	.10	.01	.14	-.03	-.07	-.08	-.04	-.07	-.04	-.10	-.09
Mid	.20	.19	.18	.11	.12	.14	.18	-.09	-.06	-.21	-.15	-.13	-.03	-.05	-.07
z obs value	1.41	.41	.90	.71	.20	1.29	.40	-.59	-.10	-1.31	-1.10	-.60	-.10	-.49	-.20
Low	.06	.15	.09	.18	.10	.01	.14	-.03	-.07	-.08	-.04	-.07	-.10	-.04	-.09
High	.21	.21	.25	.18	.04	.12	.20	.09	-.28	-.27	-.13	-.16	-.09	-.19	-.16
z obs value	1.04	.42	1.12	.00	.41	.75	.42	.81	-1.48	-.34	-.61	-.62	-.34	-.62	-.48
Mid	.20	.19	.18	.11	.12	.14	.18	-.09	-.06	-.21	-.15	-.13	-.03	-.05	-.07
High	.21	.21	.25	.18	.04	.12	.20	.09	-.28	-.27	-.13	-.16	-.09	-.19	-.16
z obs value	.08	.17	.58	.57	.64	.16	.17	1.44	-1.82	-.51	-.16	-.24	-.48	-1.13	-.73
Education															
< HS	.14	.21	.21	.18	.10	.10	.19	-.05	-.06	-.22	-.03	-.15	-.07	-.09	-.15
HS	.20	.18	.16	.15	.07	.09	.13	.03	-.05	-.12	-.14	-.16	-.05	-.04	-.02
z obs value	.67	.34	.56	.33	.33	.11	.67	.85	-.11	-1.11	-1.19	-.11	-.22	-.54	-1.40
< HS	.14	.21	.21	.18	.10	.10	.19	-.05	-.06	-.22	-.03	-.15	-.07	-.09	-.15
UC	.17	.21	.13	.15	.11	.13	.16	-.18	-.13	-.27	-.16	-.07	-.01	-.05	-.12
z obs value	.31	.00	.85	.32	.10	.31	.32	-1.34	-.72	-.54	-1.34	-.82	-.62	-.41	-.31
HS	.20	.18	.16	.15	.07	.09	.13	.03	-.05	-.12	-.14	-.16	-.05	-.04	-.02
UC	.17	.21	.13	.15	.11	.13	.16	-.18	-.13	-.27	-.16	-.07	-.01	-.05	-.12
z obs value	.37	.37	.37	.00	.48	.48	.36	-2.51*	-.96	-1.86	-.24	-1.08	-.48	-.12	-1.19

Education Groups: i) < HS (did not complete high school), ii) HS (completed high school), iii) UC (completed a university/college degree). Groups significantly differ at $*p<.05$, $**p<.01$

Chapter Four – Study Two

4.1 Overview of the chapter

This chapter begins by providing a brief overview of diabetes, the role of physical activity for diabetes management and the utility of the Social Cognitive Theory for exploring determinants of physical activity among people with diabetes. The study's rationale, objective and research questions will also be stated. Following this, methods, results, discussion, limitations and future implications of the study will be presented. Due to the overlapping nature of Study One and Study Two, some repetition is to be expected.

4.2 Introduction

The prevalence of type 2 diabetes is growing at an alarming rate, largely due to an aging population, increase in obesity and a more sedentary population (Kelly & Booth, 2003; Wing et al., 2001). Lifestyle behavioural interventions, which include physical activity and diet, may help to prevent diabetes for those at risk (Barnard, Jung, & Inkeles, 1994; Wing et al., 2001). Physical activity, in particular, may also assist those already living with diabetes to effectively manage their condition and prevent future complications (Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (CDA), 2003; Sigal, Kenny, Wasserman, & Castaneda-Sceppa, 2004).

Although several physical and mental health benefits from physical activity have been observed among people with diabetes, it is disturbing that rates of inactivity among this population are high (Health Canada, 2002). In an attempt to incorporate physical activity into their daily lives, the CDA (2003) recommends 150 minutes of at least moderate physical activity per week. The initiation and maintenance of this physical activity prescription, however, can only be accomplished when researchers and practitioners begin to understand demographic and psychosocial determinants of physical activity behaviour among this population.

Within the general population, it is suggested that sociodemographic characteristics, such as younger age, male gender, white ethnicity, and higher income and education, are related to higher rates of physical activity participation (Eyler, 2003; King et al., 1992, Trost, Owen, Bauman, Sallis, & Brown, 2002). The literature also reports that psychosocial variables including attitudes, perceived benefits and barriers, intentions, perceived behavioural control, normative beliefs, self-efficacy and social support, are significantly associated with physical activity behaviour (Eyler, 2003; King et al., 1992; Trost et al., 2002). Notwithstanding, certain demographic characteristics may also influence these specific psychosocial variables.

For example, studies demonstrate a positive relationship for physical activity and self-efficacy (Oman & King, 1998; Wallace, Buckworth, Kirby, & Sherman, 2000) and social support (Booth, Owen, Bauman, Clavisi, & Leslie, 2000; King, Taylor, Haskell, & DeBusk, 1988) for both male and female adults. Yet, it may predict differently across gender based upon activity status (Litt, Kleppinger, & Judge, 2002; Sallis, Hovell, Hofstetter, & Barrington, 1992; Troped & Saunders, 1998). Additionally, the relationship between physical activity and self-efficacy and social support may be partially determined by socioeconomic status (SES) (Clark, 1996; Grembowski et al., 1993). Further, some studies suggest that men and women and individuals of low and high SES report different environmental facilitators and barriers to physical activity (Brownson, Baker, Housemann, Brennan, & Bacak, 2001; Burton, Turrell, & Oldenburg, 2003; Giles-Corti & Donovan, 2002).

Among people with diabetes, correlates are less well-studied and understood. Preliminary research reports physical activity behaviour to be significantly associated with demographic factors such as age, gender, ethnicity, and education (Hays & Clark, 1999; Nelson, Reiber, & Boyko, 2002; Notwehr & Stump, 2000), and psychosocial variables including self-efficacy, social-support, outcome expectations and outcome expectancies (Kingery & Glasgow, 1989; Padgett, 1991; Pham, Fortin, & Thibaudeau, 1996; Skelly, Marshall, Haughey, Davis, & Dunford, 1995; Wilson et al., 1986). Thus far, differences in psychosocial determinants of physical activity have not been explored across SES among this population. Further, only three studies have examined gender differences among physical activity attitudes (Fitzgerald, Anderson, & Davis, 1995), performance and outcome expectations (Hays & Clark, 1999) and barriers and preferences (Wanko et al., 2004).

Wanko and colleagues' (2004), for example, examined gender differences among adults with type 2 diabetes and reported that females reported more barriers to physical activity than males. Wanko and colleagues' also explored physical activity preferences among this population and reported that walking was the most popular activity, but no gender differences were apparent. Consequently, there is a lack of literature examining psychosocial determinants of physical activity behaviour and preferences for physical activity interventions, across demographic characteristics among people with type 2 diabetes.

The Social Cognitive Theory (SCT) is one of the most popular theories used to explain physical activity behaviour, and may prove useful for exploring demographic differences in psychosocial influences among people with type 2 diabetes. Research has used the SCT to guide behaviour change interventions for people with type 2 diabetes. These studies have operationalized self-efficacy, outcome expectations, social support, goal setting, problem solving skills, reinforcement and overcoming environmental barriers, and have been met with moderate to high success (DiLoreto et al., 2003; Glasgow et al., 1992; Keyserling et al., 2002; McKay, King, Eakin, Seeley, & Glasgow, 2001; Tudor-Locke et al., 2004).

To date, there are no known studies in any populations that have examined SCT in its entirety as it relates to physical activity behaviour across demographic characteristics. As such, this study explores the meaning and personal significance of SCT constructs among men and women with type 2 diabetes of high and low income.

4.3 Rationale of the Study

Currently, there is a limited amount of literature regarding: i) social-cognitive determinants of physical activity behaviour, and ii) preferences for physical activity interventions, among people with type 2 diabetes. Moreover, there is a gap in knowledge concerning whether differences in these determinants and preferences exist among men and women, and individuals of varying socioeconomic status. Consequently, these potential differences need to be explored so that physical activity interventions can be targeted and tailored to meet the needs of people with type 2 diabetes.

4.4 Objective of the Study

This study is exploratory and descriptive in nature. It utilizes a qualitative approach, conducting telephone interviews to explore the meaning and personal significance of Social Cognitive Theory constructs related to physical activity behaviour for people with type 2 diabetes. It is our hope that the results from this study will provide a contextual understanding of the quantitative data from Study One and additional constructs which were not explored in Study One. Further, Study Two has a subsidiary objective to explore preferences for physical activity interventions among people with type 2 diabetes, in order to make recommendations for the development and implementation of community interventions. The research questions include:

1) What is the meaning and personal significance of Social Cognitive Theory constructs (*i.e., self-efficacy, environment, situation, outcome expectations, outcome expectancies, behavioural capability, observational learning, self-control, reinforcements, and managing emotional arousal*) on physical activity behaviours for men and women of high and low income?

2) What are preferred physical activity interventions for men and women of high and low income?

4.5 Methods

4.5.1 Background

Participants for this study were recruited from a larger research project, the **A**lberta **L**ongitudinal **Ex**ercise **a**nd **D**iabetes **R**esearch **A**dvancement (*ALEXANDRA*) Study[1] (Plotnikoff et al., 2001-2005). Participants for *ALEXANDRA* were recruited via two protocols. The first strategy involved a convenience sample of 1923 individuals (609 type 1; 1307 type 2; 7 missing type) from the Canadian Diabetes Association registry (Alberta Chapter). The second strategy recruited individuals (88 type 1; 307 type 2; 1 missing type) using a randomized digit dialing protocol of Albertan households. Participants were pooled for a combined sample of Albertans, aged 18 years and older with type 1 or type 2 diabetes (n=2319). Specifically, the study contained 1614 individuals with type 2 diabetes.

Participants in the *ALEXANDRA* study completed self-report questionnaires at three time points: baseline (Spring 2002), 6 months (Fall 2002), and 18 months (Fall 2003). The questionnaires contained biomedical, socio-demographic, psychosocial and behavioural measures related to physical activity.

4.5.2 Recruitment

Recruitment procedures and response rates are illustrated in Figure 1. Participants from the *ALEXANDRA* cohort were asked on the survey completed at 18 months (Fall 2003), to indicate whether they could be contacted to participate in future studies. From this cohort of 1614 individuals with type 2 diabetes, 694 agreed to be contacted for future research projects.

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[1] ALEXANDRA study co-investigators include Birkett, Courneya, Johnson, Raine, Sigal & Svenson. The ALEXANDRA study is funded by the Canadian Diabetes Association (CDA) and Alberta Heritage Foundation of Medical Research (AHFMR).

Based upon participants' demographic profile and physical activity behaviour from surveys completed in the Spring of 2002, participants were stratified by gender, income and physical activity behaviour. Income groups were based on Alberta's cut-points, using <$20,000 for *low income* classification and >$80,00 for *high income* classification (National Council of Welfare, 2004). Physical activity behaviour was classified as *active* or *inactive* based upon meeting CDA's (2003) recommendations of 150 minutes of moderate activity per week. Four groups were created (based upon gender and income), with two subgroups within each group (based upon activity level): i) low income men (19 inactive, 6 active); ii) high income men (42 inactive, 44 active); iii) low income women (38 inactive, 7 active); and, iv) high income women (22 inactive, 15 active).

Using a quota sampling technique (Trochim, 2001), 4 participants were randomly selected from these 8 subgroups yielding a total of 32 potential participants. These 32 potential participants were contacted via mail. The initial mail-out resulted in a 75% response rate (n=24). Of these responses, five were excluded [did not want to participate (n=3), hard of hearing (n=1), deceased (n=1)]. The remaining nineteen received a follow-up telephone call to answer any questions about the study, and to set a time and date for the subsequent telephone interview. Fifteen interviews were conducted, as the remaining four potential participants could not be reached (n=2) or had changed their mind about participation in the study (n=2). The demographic profile of the 15 participants recruited from the initial mail-out was: 3 low income men (2 inactive, 1 active), 5 high income men (2 inactive, 3 active), 1 low income women (inactive), and 6 high income women (2 inactive, 4 active).

It was evident from the response rate of the initial mailout that there was a poor response from low income individuals, specifically low income women. In an attempt to ensure adequate representation of these groups in the study, a second mail-out was sent to 5 low income men (3 inactive, 2 active) and 9 low income women (6 inactive, 3 active), totaling 14 potential participants. The second mail-out yielded a 64% response rate (n=9). Of these responses, four were excluded [returned due to inaccurate address (n=1), did not want to participate (n=3)]. The 5 interested participants (1 man and 4 women) all completed telephone interviews, bringing the total sample to 20.

The final sample consisted of the following: i) 4 low income men (3 inactive, 1 active); ii) 5 high income men (2 inactive, 4 active); iii) 5 low income women (4 inactive, 1 active); and, iv) 6 high income women (2 inactive, 3 active).

4.5.3 Sample

Table One displays demographic characteristics and physical activity behaviours for the sample. The sample (N=20) consisted of 9 males and 11 females ranging in age from 34-86 years (M=64.1 yrs, SD=11.4). Participants varied in working status, with 20% reporting they were engaged in full-time work (n=4), 35% part-time work (n=7), and 45% retired/not currently working (n=9). The majority of the sample (80%) was married (n=16). Further, 20% lived in rural areas (n=4), and 40% lived in communities with a population of 10,00 or less (n=8).

Participants averaged 193.4 (SD=205.3) minutes per week of moderate and/or strenuous physical activity. Overall, 55% were classified as inactive (n=11), and 45% were classified as active (n=9). The amount of participants defined as active in our sample (45%) is slightly above average based upon Canadian data, which reports that

35% of Canadians with diabetes aged 20+ years are sufficiently active to achieve health benefits (Health Canada, 2003).

Overall, there were no major differences between men and women on any socio-demographic characteristics, with the exception that women (M=60.0, SD=9.8) were typically younger in age than men (M=69.1, SD=11.7). Across income groups, high income individuals (M=61.5, SD=11.0) were generally younger than low income individuals (M=67.2, SD=11.7), with a more noticeable difference among women. Further, individuals of high income were more likely to report that they were married and engaged in full- or part-time employment. Conversely, individuals of low income were more likely to report that they were retired or not currently working.

In general, men had higher average minutes of weekly physical activity than women, and high income individuals had higher average minutes of weekly physical activity than low income individuals. For example, men of high income averaged the most weekly minutes of physical activity (M=314.6, SD=359.2) and women of low income averaged the least (M=93.6, SD=57.6). For both genders, approximately three-quarters (75-80%) of individuals of low income were classified as inactive, whereas almost the reverse was true for high income individuals where approximately two-thirds (60-67%) were classified as active.

4.5.4 Procedures

The study was approved by the Research Ethics Board of the Faculty of Physical Education and Recreation at the University of Alberta (Appendix III). Telephone interviews were conducted by the researcher between March and April 2005, at a time convenient for the participant. Participants were advised that the aim of the study was to explore physical activity attitudes, beliefs, opinions and behaviours among people with type 2 diabetes. Each telephone interview lasted approximately 30 minutes.

An interview guide was used, which included several semi-structured, open-ended questions, with additional elaboration probes. Where appropriate, the researcher used probes to: 1) enhance understanding if something is unclear; 2) deepen the thoughts of the participants; and, 3) keep the conversation on topic (Morgan & Krueger, 1998). All interviews were audio-taped, upon being granted permission by the participant, and transcribed verbatim.

4.5.5 Instrumentation

The interview guide contained semi-structured questions with additional elaboration probes (Appendix II). It consisted of four sections: a) meaning and patterns of physical activity; 2) SCT constructs associated with physical activity; 3) preferences for physical activity; and, 4) socio-demographic profile.

In Section A, three questions were asked in order to explore: 1) the meaning of physical activity for participants; 2) which activities participants defined as part of their physical activity routine; and, 3) whether having diabetes changed their physical activity patterns. For classifications of physical activity behaviours, *leisure-time physical activity* was defined as "a physical activity performed during exercise, recreation, or any additional time other than that associated with one's regular job duties, occupation or transportation" (Statistics Canada, 2004). *Non-leisure physical activity*, also commonly referred to as *lifestyle physical activity*, was defined as "a self-selected activity associated with occupation, household or child caring that can be a planned or unplanned activity that is part of everyday life." (Dunn, Anderson, & Jakicic, 1998). For our purposes, the defining difference was that *leisure-time physical activity* was a planned activity that is scheduled into one's daily routine for the purposes of exercising.

In Section B, SCT constructs such as self-efficacy, environment, situation, outcome expectations, outcome expectancies, behavioural capability, observational learning, self-control, reinforcement and emotional coping responses were operationalized for the interview guide. Operationalization of SCT constructs, originally developed by Albert Bandura (1986), were based upon definitions by Baranowski, Perry, and Parcel (2002).

Self-efficacy was defined as one's confidence in their ability to engage in the behaviour under a specific situation. Participants were asked "How confident are you that you can be physically active on a regular basis?". Additional probes were added to comprehend their level of confidence under varying circumstances (i.e. tired, bad weather, other demands on time).

Within the SCT, *environment* typically refers to objective factors (both physical and social) that may affect a person's behaviour, whereas *situation* is an individual's perception of their environment, circumstance or condition. Participants' were asked "What kinds of things make it difficult for you to be physically active?", and "What kinds of things make it easy (or easier) for you to be physically active?". Additionally, probes were asked to explore physical and social environments/situations that affect participants activity (i.e., Do have access to a place where you can get physical activity?, Do you receive support for participating in physical activity from others?).

Outcome expectations were defined as the anticipated result of the behaviour, which could be positive and/or negative. Participants were asked: i) "How important do you think that physical activity is for managing your diabetes?", ii) "What, if any, positive effects do you think physical activity may have for yourself?" and, iii) "What, if any, negative effects do you think physical activity may have for yourself?". Probes were used to comprehend any possible expected outcomes for different aspects of health (i.e., physical and mental health, and to diabetes specifically).

Outcome Expectancies differ from expectations in that expectancy is the value an individual places on the outcome. To explore this construct, participants were asked about the value they placed on positive or negative outcome expectations for physical activity. For example, participants were asked "Even if you were very tired and didn't feel like getting out of bed that day, are any of the positive effects of physical activity so important that no matter what, you would be willing to do the activity?" and "Are any of the negative effects of physical activity so significant that it would prevent you from participating in the activity?"

Behavioural capability is an individual's knowledge and skill for physical activity. To explore this, participants were asked "Do you feel that you have enough knowledge to engage in regular physical activity?", and "Do you feel that you have enough skill to perform regular physical activity?". If participants answered yes, additional probes were used to examine where they acquired their knowledge and skills. If participants answered no, probes were also used to determine what knowledge and/or skills they felt they were lacking. Further, a question was posed to explore their relationship with medical professionals, in which participants were asked "When you go to see your doctor and/or diabetes specialist, do you feel that he/she talks to you enough about the role of physical activity for the management of diabetes?".

Observational Learning occurs when an individual watches and learns from the actions of others. To explore this construct, participants were asked "Do you think you watch and learn from others about how to be physically active?". If participants answered yes they were probed specifically about who they watched and learned from.

Within the SCT, self-control, reinforcement and managing emotional arousal are separate constructs, yet have overlapping components. *Self-control is* conceptualized as personal regulation of the behaviour. This can be accomplished through self-monitoring (i.e. logs, pedometers), goal setting, and the use of problem solving skills. *Reinforcements* can be either positive or negative in nature, however, they work to increase the likelihood that a desired behaviour is performed. Positive reinforcement often employs the use of rewards or incentives (both external and internal) to promote a given behaviour. *Managing emotional arousal* explains that specific stimuli can promote fear/anxiety, thereby resulting in lack of desired behaviour. Therefore, in order to promote the desired behaviour, an individual's emotions must be brought under control. This can be accomplished through cognitive techniques (problem solving and restructuring) and stress management techniques.

To explore self-control, reinforcements and managing emotional arousal, participants were asked "Are there any strategies that you use to get yourself to be physically active". Probes were also used to inquire about monitoring tools, setting goals, the use of rewards and problem solving techniques.

Section C of the interview guide explored preferences for physical activity. Participants were asked what an ideal physical activity program would look like for themselves. The word "ideal" was explained so that participants could express preferences for a program in which cost, access, time and ability would not be limiting factors.

The first question involved program format. Participants were probed whether they would like a *structured program*, which would include a personal trainer that led and laid out activities for them, or an *unstructured program* that would allow them to choose which activities they would like to do and when. Further, participants were asked if they would like any tools involved in this program, such as information pamphlets and motivational counseling. Participants were also asked about individual/group makeup, time of day, intensity, and activities to be included. Additionally, participants were asked whether they would prefer the program at a facility, or in and around the house/neighbourhood (which could include both indoor- and outdoor-based activity).

Finally, three sociodemographic questions regarding marital status, employment and income completed the interview guide. The purpose of these questions were to provide an updated sociodemographic profile, based on previous information collected from surveys in the Spring of 2002. These questions were validated by Plotnikoff, Hotz, Birkett, and Courneya (2001) on a Canadian population.

4.6 Data Analysis

In order to analyze the interview sessions, the researcher followed a content analysis approach (Morse, 1991). This approach utilized descriptive and exploratory methods to search for patterns and themes (Rothe, 2000). This occurred through several stages: 1) Verbatim transcription of the audio-tapes; 2) Surface analysis was conducted, which entailed reading over each transcript in it's entirety to capture its holism (Rothe, 2000); 3) Transcripts were broken down into units of analysis in order to extract and develop a number of different codes (Miles & Huberman, 1994; Trochim, 2001); 4) Open coding by hand, was used to categorize the data into emergent themes and link it with real examples from the text (Ryan & Bernard, 2000); 5) Comparisons between transcripts were made, so that common themes could be linked and summarized (Trochim, 2001).

A priori codes were developed based upon Social Cognitive Theory (SCT) constructs and questions from the interview guide (Miles & Huberman, 1994). The advantage of using *a priori* coding is that the researcher uses a provisional 'start list' of codes defined prior to the coding process, which makes it easier for organizational purposes (Miles & Huberman, 1994). The disadvantage is that that it predefines themes, thus potentially masking legitimate new themes. For this research, *a priori* codes represented categories (i.e. SCT constructs), and emerging codes were also developed based upon themes within each category. Coding was undertaken until saturation was reached (Trochim, 2001).

4.7 Data Verification & Interpretation

In order to clarify and confirm any unclear responses made by participants during the interview, elaboration probes were used. Participant's responses were also re-phrased and repeated back to the them during the interview to improve credibility (Trochim, 2001). Themes derived from the data were explored for the entire sample and then further explored across gender and income groups to establish commonalities and/or differences. Descriptions and generalizations were also compared to previous research in this domain.

4.8 Results

4.8.1 Research Question One

Salient SCT Constructs for the Sample

In order to get participants thinking about physical activity, an initial question was asked regarding what they considered to be part of their physical activity routine. Although this was not a research question, it did produce findings worthy of reporting. For example, participants reported a wide variety of self-defined leisure and non-leisure activities. Leisure-time physical activities that were mentioned included walking for exercise, jogging/hiking, resistance training, aerobics classes and sports. Non-leisure or lifestyle activities such as walking for errands, housework and/or yardwork, an active lifestyle (taking the stairs), farming and playing with children/grandchildren were also mentioned. Walking, both as a leisure and non-leisure activity, was the most popular activity for the sample.

Overall, participants reported high self-efficacy, as the majority stated they were "quite" or "very" confident to perform physical activity on a regular basis. Participants were less confident, however, to perform physical activity when the weather was bad, when tired or when they had other demands on their time. With regard to their physical environment, personally significant influences for physical activity included availability of facilities, weather, scenery and physical conditions (i.e. uneven surfaces and stairs). The majority of participants also reported that their social environment was an important influence on physical activity behaviour. The source of their social support mostly came from family and/or friends, and varied between verbal, companionship and assistance.

When asked about situational influences, several participants stated they had a physical condition/disability/injury which sometimes made it difficult to participate in physical activity. These included a hip replacement (2), arthritis (3), plantar fasciitis (1), knee/leg injury (3), pacemaker (1) and polymyositis (1). Further, some participants mentioned that having diabetes, specifically trying to balance sugar levels, could act as a hindrance to physical activity. Lack of motivation and enjoyment, work schedule, being too tired, self-consciousness and other demands were also mentioned as barriers to regular physical activity.

In contrast to these barriers, participants reported several meaningful situational facilitators that motivated or made it easier for them to be physically active. For example, being in good physical health, enjoyment, and participating in the activity in a group atmosphere or with a partner, were all mentioned as facilitators. Moreover, many participants felt that having diabetes prompted them to be more active. (Each quote in the following sections represents a separate individual).

> "When I was forty the weight started packing on and it just didn't come off until I had finally eaten my way into being a diabetic, that's basically what happened. There's no one to fault but myself. Unfortunately it had to come to that, you know what I mean? Had it been more of a driving force in earlier years, perhaps I wouldn't have diabetes today. When I was diagnosed I certainly decided to pay a lot more attention." – *High Income Woman*

> "I sort of push myself more, because I know that I have to do the exercise in order to keep your sugar levels down. I push myself to do a lot of things that I would not normally do if I didn't have this, you know?" – *Low Income Woman*

> "I'm much more active now than I was before. Yeah, because I didn't make an effort to do walking or anything like that before, until I realized the importance of it. And then I got to like it, and I look forward to it now." – *High Income Man*

In terms of the anticipated outcomes of physical activity, the majority of participants believed that physical activity had some benefit to their physical and/or mental health. Further, many experienced positive effects specific to their diabetes condition, namely that physical activity helped regulate blood sugar levels and maintain weight. Overall, participants placed great value on the expected positive outcomes of physical activity.

As for any anticipated negative effects, several participants reported that physical activity could aggravate existing physical conditions, make your muscles and/or joints stiff/sore, make you feel tired, and effect blood sugar levels. Nevertheless, negative outcome expectancies were low, as the majority of participants felt that there were no negative effects that were so significant it would prevent them from engaging in their activities.

When questioned about their capability to perform regular physical activity, most participants felt they had adequate knowledge and skills. The most popular sources of this knowledge and skill came from reading, followed by their family doctor, general lifelong learning and diabetes seminars. Some participants also stated that they learned by observing others, specifically an instructor/personal trainer, tv/videos, and peers/family. When further probed about the role of their doctor, the response was mixed. Some participants believed that their doctor did not talk about physical activity enough, and they speculated this was because doctors were too busy/had no time, lacked specialty in this area, or already knew their patients were being active/controlling their weight.

> "The doctors encourage it. One of them, he says 'the lifestyle of a couch potato is not conducive to helping a person's diabetes, you see, the more activity that you get, the better off you are, and I think he's right." – *Low Income Man*

> "Oh, he doesn't talk at all about it. He talks about drugs for my diabetes, but I think this is true of many doctors. I'm more up on the new drugs than he is, but he doesn't have time. But I think because he's dealing with such a wide range of complaints, they can't keep up with them all." – *High Income Man*

> "I don't think it's stressed enough. I don't think they're educated enough in how to instruct their patients, they ship you off to these big group sessions." – *High Income Woman*

To examine self-control, reinforcement and managing emotional arousal, participants were asked if they engaged in any strategies to encourage themselves to be physically active. Some participants did engage in self-control strategies, such as setting goals, planning ahead and having alternative strategies in place for physical activity.

> "Like this morning I never got out of bed cause I was tired, so I like broke it up into smaller chunks and did it after I was home from work." – *High Income Woman*

> "And as far as going to the gym and doing weights and stuff, well I go a couple of times a week and get my groceries, I split it up and I carry my groceries home, so I think I get a bit of weight control that way." - *Low Income Woman*

> "If it's really blowing a Gael and it's minus 40 we don't run outside, it's not very safe, but we can run the stairs." – *High Income Man*

Reinforcement strategies were not meaningful for the majority of participants. Of those who did employ reinforcement, it was verbal reinforcement or the use of internal (i.e., weight loss) and external (i.e. something new, food) rewards. Managing emotional arousal was interpreted as participants engaging in any cognitive problem solving skills to deal with the emotional stressors of diabetes. For example, some participants mentioned that physical activity could lead to potential complications, which in turn, could cause fear and anxiety. Therefore, if participants planned ahead for possible complications or were prepared to deal with possible complications from physical activity, this was conceptualized as managing emotional arousal. Managing emotional arousal was only personally significant for some participants, who mentioned eating ahead of time or carrying food/sugar tablets to manage physical activity induced changes to blood sugar levels.

Patterns of SCT Constructs Across Gender

Although men and women in our sample participated in similar types and amounts of physical activity, women were more apt to define physical activity by incorporating non-leisure/lifestyle activities. For example, women included living an active lifestyle (e.g., taking the stairs, parking further away), playing with children/grandchildren and occupational activities as part of their regular physical activity. Moreover, women were more likely than men to report low self-efficacy for participating in physical activity when the weather was bad and when they had other demands on their time. Lack of available facilities for physical activity was also particularly meaningful among women.

> "No, I mean where we live, I know if we lived in a town I could do lots of other things, but living out here I can't. It would be like 25 miles and especially now with the gas prices what they are, that's just not an option." – *Low Income Woman*
>
> "We don't have the gyms and things that they do in cities, our access to things is limited." – *High Income Woman*

Although several men and women reported social support as personally significant, women were more likely to report receiving some type of social support for physical activity. In contrast, men tended to talk more in-depth about the role of their spouse, not necessarily in terms of support for physical activity, but for managing their diabetes condition in general.

> "My wife is very good about saying 'you know it's been four days and you haven't done nothing', and she'll get me going again." – *High Income Man*
>
> "My wife's a nurse, and she's been keeping good control of my diabetes." – *High Income Man*
>
> "With my diabetes, my wife, she keeps me on my toes." – *Low Income Man*

Several patterns also existed between men and women for situational influences. For women, lack of motivation and enjoyment were personally significant barriers to regular physical activity. Other demands from children/grandchildren, running errands and cooking were also personally significant. Additionally, the expected negative outcome that physical activity would 'take too much time' was only meaningful among women.

> "I always feel that if there are people working here, I have to be here. And that I think is the worst thing. Or at one time, we used to have a construction company as well, and I always felt like I had to be by the phone." – *High Income Woman*

> "Well, it would depend what the schedule was like, if I could do my physical activity. If demands were put on me by other people like looking after the grandchildren, then probably not."
> – *Low Income Woman*

With regard to behavioural capability, women and men both reported having adequate knowledge and skills to participate in physical activity. Yet, women were more likely than men to report that they lacked knowledge and skills in certain areas, specifically regarding appropriate types of activities, balancing aspects of self care, strength/resistance training, and foot care. Nevertheless, women were more likely to report that they gained knowledge and skills for physical activity by reading and observing others. In fact, one woman could not overemphasize the importance of her support group for learning new knowledge and skills, not only for physical activity, but other diabetes-related activities.

> "I like to watch what other people are doing. Like often with this support group too, if you get with a group and you're talking I often pick up ideas from other people, also other people that have had diabetes for longer than I have, for just like information, or input, like what could you do that was different, and what do they do. Cause I do go to the senior's center here and there are a lot of people with diabetes, there's a lot of people that have good ideas about what to do." – *Low Income Woman*

Finally, it appeared that self-control strategies for physical activity were more meaningful for women. Specifically, only women reported the use of self-monitoring techniques.

> "I write it in, I keep track in my log book. I guess it's a motivational tool." – ***High Income Woman***

> "I've been thinking about increasing my amounts (of physical activity), and I've got a pedometer. You know that stepper, I just wanted to see if I do 10,000 a day already, or where am I at, cause you'd have something to kind of judge." – ***High Income Woman***

Patterns of SCT Constructs Across Income Groups

When examining types of activities across income groups, several patterns emerged. For example, high income individuals tended to participate in activities such as jogging/hiking, aerobics classes, strength training and sports. In contrast, low income individuals reported some similar leisure-time activities, but were more likely to report walking for errands and activities of daily living, such as housework and yardwork. Further, many low income individuals reported low self-efficacy to participate in activity when tired.

With regard to the physical environment, many high income individuals indicated the availability of facilities/equipment as a meaningful influence for their physical activity behaviours. Nevertheless, many individuals of high income also stated that work demands/schedule could make it difficult to participate in physical activity.

> "The availability and accessibility of what I'm going to be doing. I guess I find with my treadmill at home because I have it at home and I have an exercise mat and weights and everything else all set downstairs, I find that I'm a lot more receptive to exercising that way, then if I go to a gym let's say." – ***High Income Woman***

> "When people set lunch hour meetings, this could do in my noon hour run. I don't think people should set lunch hour meetings, I think this is sacrificing others time, but anyway." –***High Income Man***

Expected outcomes from physical activity were also slightly different among income groups. For example, only individuals of high income stated that physical activity could aggravate existing physical conditions. Conversely, only low income individuals felt that physical activity could negatively affect their blood sugar levels.

Finally, reinforcement appeared to be salient for more individuals of high income. Specifically, external rewards such as food/drinks, were of personal significance for reinforcing physical activity behaviour.

> "I play this game, like if I'm going to do a really high fat meal, like really lots of cream and sauces, I might work out, walk, jog, bike for 3-4 hours that day. Just kind of like put it in the bank." – *High Income Man*

> "Oh, physical activity is important, because then I can eat more, I can treat myself to things that you think that you can't have, or that you shouldn't have if you don't move." – *High Income Woman*

Patterns of SCT Constructs Across Income Groups – For Women

Across income groups among women, different patterns were observed in the meaning of physical activity. Several of the low income women, for instance, stated they did not engage in activities for the sake of exercise, but instead engaged in activities that were necessary, such as walking to get the mail and/or groceries, and doing activities around the house (e.g., vacuuming, shoveling snow etc). In contrast, women of high income all described physical activity as a structured and planned activity that would be in addition to their daily activities. Some high income women also included active living (e.g., taking the stairs, parking further away) as part of their physical activity routine.

> "Physical activity is not being a couch potato, walking, doing stairs. I'm still part-time working so I'm out and about, in and out of my car, up and down different buildings." – *High Income Woman*

> "Physical activity is just being active every single day. I usually take the stairs whenever I can, and park farthest away from the door, those kind of things." – *High Income Woman*

Patterns across income groups were also seen when the women talked about their environment and situation. Only women of high income stated the availability of facilities made it easier for them to be physically active. Conversely, only women of low income reported safety concerns, such as heavy traffic and stray dogs, as barriers to physical activity. Moreover, only women of low income mentioned that cost could act as a barrier to engaging in regular activity.

> "My doctor suggests maybe I go to a gym or I swim, you know rather than just walking to do these other things, but I'm considering it, but there's also cost factors. And I think that's one of the things that maybe you know, puts me off, why I just keep walking."
> *– Low Income Woman*

> "But, like I say, unless I go and pay for it, and I don't have the money to be paying for somebody to train me so, I just do the best I can with what I got." *– Low Income Woman*

Overall, all women felt they received support to be active. Notwithstanding, the primary source of the support appeared to differ between groups. Women of low income, for example, reported that friends were likely to accompany them in their activities. For women of high income, companionship from family was more common. Further, women of high income were more likely report learning about physical activity by observing others, and monitoring their physical activity behaviour through the use of log books and pedometers.

Patterns of SCT Constructs Across Income Groups – For Men

Generally, high and low income men participated in similar activities and shared a similar definition of physical activity. A pattern was observed that high income men were more likely to mention receiving social support to be active, specifically in the form of companionship. The most obvious difference between high and low income men, however, was in regard to self-control and reinforcement strategies. For several high income men, setting goals, planning ahead and making alternative arrangements were salient strategies for participating in physical activity. Men of low-income did not mention any of these strategies.

> "If I have a goal, like now it's easier I have a goal, so it's much easier for me to say that I'm going to exercise every day. And the closer I get to the goal, the more I want to exercise" *– High Income Man*

> "On the road see, I travel a lot (for work). And when I do that thing, I do exercise in the car. Stretching and sort of breathing with my stomach and then you see I get my exercises that way. And I carry my golf bag with me in the car, so wherever I'm traveling and I see a golf course I always stop and play." *– High Income Man*

4.8.2 Research Question Two

Preferences for an *ideal* physical activity program varied greatly across the entire sample, and some patterns existed for gender and income groups. In terms of program format, responses were mixed, as approximately half indicated they would prefer an unstructured program. Specifically among men, it was reported that they all preferred an unstructured program, often stating that they would rather 'do their own thing'.

> "In my working life everything was kind of structured, but if I got to start planning it where at 9 minutes after 9 I got to start walking and stuff like that no, I don't want that." *– Low Income Man*

> "I don't need that thing (a personal trainer). I do it my own way and just do whatever I can, but other that, under that influence of I must adhere to what he says, and then sometimes may not be able to fulfill it and then you feel down, for not having accomplished that goal. I don't want to get under a personal trainer, no." *– High Income Man*

For women the reverse was true, as more preferred the structured program. Of these women who wanted a structured program, the majority indicated this was preferred because it would give them guidance and motivation. Furthermore, more low than high income women preferred a structured program, yet many low income women also mentioned the potential cost of a structured program.

> "I'd like a structured program, if I could afford it yes, I think anybody would. I wouldn't mind trying it (a personal trainer). You know it might not work, but it's worth a try." *– Low Income Woman*

Participants expressed a minimal interest in any types of intervention tools, such as information pamphlets and motivational counseling. High income men, in fact, indicated no interest in any intervention tools. When asked about the types of activities to be included in their ideal physical activity intervention, many participants stated they wanted to continue with their current activities, which mostly included walking. When probed about other types of activities, over half expressed an interest in starting a resistance training program. Additionally, several women wanted to participate in swimming and/or water aerobics, however, many re-affirmed that facilities were not available where they lived.

> "I myself prefer what I'm doing now. But, like I say, I've never done, been on a regular physical activity program, which maybe if I lived in a city where there was one offered, maybe I would do it. You know, I don't know." – *Low Income Woman*

Participants were further asked about preferences for time of day and intensity of activity. Several participants preferred mornings, with many stating this was the time in which they had the most energy. For other participants, their activity schedule was not a personal choice, but instead they had to exercise at times of the day when it worked best with their blood sugar levels. Additionally, most participants preferred low-to-moderate intensity activity. Socioeconomic status differences in intensity of activity were apparent, as only high income individuals indicated that they enjoy high intensity.

With regard to participant makeup for these activities, the response was split between a preference for solitary and group. There was a noticeable gender difference, as the majority of men stated they preferred participating in physical activity on their own. For women, a greater number preferred group activities, with half indicating they wanted women-only groups and the other half stating group makeup did not matter. When women were probed about why they would prefer group activity, the majority felt group participation would increase motivation, make them work harder, and the activity would be more enjoyable.

Finally, participants were asked about preferred program location. Many participants preferred a program that could be done in and around the house. Reasons given for this preference include accessibility, convenience, outdoor enjoyment and dislike of traditional gyms.

> "Like right now, because my husbands schedule and my kids are young, it's easier to do exercises within the house." – *High Income Woman*

> "I joined a club over here about 5 years ago and my work, you see, kept me away for going there all the time. So, I thought that was a waste of time." – *High Income Man*

> "No, that (a facility) doesn't interest me. I would much prefer it to be outside. I would want to cycle on a road somewhere. I like looking at the scenery and they have interesting things go by. Nothing much changes on an exercise bicycle indoors." – *High Income Man*

No obvious SES patterns existed with regard to program location, but there were some differences between gender. For example, all of the men in the sample preferred a home-based program, whereas for women the response was mixed between home-based and indoor facility. Reasons given for those women who preferred a facility included: not enough room for equipment at home, bad weather and they enjoyed current gyms such as Curves.

4.9 Discussion

Although physical activity behaviour was not a research question among this study, interesting patterns emerged that are worthy of discussion, especially when exploring patterns across demographic groups. Walking, for leisure or as part of one's lifestyle, was the most common activity of the participants' daily physical activity routines. This is consistent with other literature reporting that walking is the most popular physical activity among people with diabetes (Krug, Haire-Joshu, & Heady, 1991; Wanko et al., 2004). This finding is also consistent with other research suggesting that walking is the most preferred activity for demographic groups typically more sedentary (e.g., women and individuals of lower income) (Eyler, Brownson, Bacak, & Houseman, 2003).

With regard to self-efficacy, the majority of participants in this sample reported high self-efficacy to engage in physical activity on a regular basis. This is surprising as it is suggested that self-efficacy is positively associated with physical activity behaviour (Oman & King, 1998; Sallis et al., 1992). Since less than half of the sample was classified as *active*, it would seem reasonable that more variation in self-efficacy would have been encountered. This finding may have resulted from the wording of the interview question. For instance, physical activity was self-defined by participants, thus many deemed their lifestyle or non-leisure activities as "physical activity". Conversely, if the question had been worded "How confident are you that you can perform *leisure-time* physical activity on a regular basis?", responses may have produced more variable results.

Participants in the present sample discussed many environmental and situational facilitators and barriers to physical activity. Parallel to findings in the general population (Brownson et al., 2001; Giles-Corti & Donovan, 2002), it appears that access to facilities and the weather are common physical environmental influences. The most frequently described situational barrier was a physical condition/disability/injury, a finding also consistent with the literature (Marcus, Dubbert, King, & Pinto, 1995; Salmon, Crawford, Owen, Bauman, & Sallis, 2003; Trost et al., 2002). This finding is to be expected as the average age of our sample is older, and having diabetes can often result in circulatory, sensory and cardiovascular complications (CDA, 2003; Health Canada, 2002).

Interestingly, a theme emerged that diabetes could act as a situational influence to encourage physical activity behaviour. For example, several participants spoke about how they became more active after the diagnosis, and mentioned that having diabetes actually prompts them to engage in regular physical activity. This is disheartening because it suggests that many people at risk are not physically active enough to ward off the progression to diabetes, thus it takes the actual diagnosis to persuade people to be physically active. It is also encouraging, however, because it suggests that many people with diabetes take their disease seriously and engage in positive self-care behaviours.

It was also encouraging that every participant in this study named positive outcome expectations of physical activity, and all but one identified physical activity as very important for self-management (high expectancies). Although this finding is promising, suggesting that many participants are aware of the potential benefits of physical activity and find these benefits valuable, it may also reflect a self-selection bias. Hallam and Petosa (2004) for example, noted that outcome expectancy values for participants' who self-selected to join a fitness center treatment had significantly higher pretest scores than participants' in a comparison group. Consequently, the present study and others suggest that people who choose to take part in research studies or interventions may place a higher value on the anticipated benefits of physical activity.

Further, the majority of participants felt they had adequate knowledge and skills to perform regular physical activity. Plotnikoff, Brez & Brunet's (2003) study among a community sample of adults with diabetes reported that participants were aware of the importance of exercise for controlling their condition, thus suggesting that clinical strategies in combination with more recent public campaigns are resulting in high levels of awareness. In contrast, Hays and Clark (1999) demonstrated a knowledge deficit regarding statements related to physical activity among people with type 2 diabetes. As a result, continuing to increase knowledge among this population may still be valuable, as it has also been suggested that many people with diabetes view physical activity as one of the hardest aspects of the self-care regimen (Nelson et al., 2002; Schultz, Sprague, Branen, & Lambeth, 2001).

To further understand sources of potential knowledge regarding physical activity, participants were probed about the role of their healthcare provider. The response was mixed, with many participants reporting they did not receive enough information and advice. Not enough time, lack of specialty and not being overweight, were all given as potential reasons for limited discussions with their doctor. Other studies report similar findings, suggesting that barriers to regular advice by doctors include lack of time, limited reimbursement for services and lack of confidence to instruct patients (Orleans, George, Houpt, & Brodie, 1985; Simons-Morton, Calfas, Oldenburg, & Burton, 1998; The Writing Group for Activity Counseling Trial Research Group, 2001).

Specifically among people with diabetes, they report receiving less education, support and encouragement for physical activity, when compared to other aspects of self-treatment (Ruggiero et al., 1997; Wilson et al., 1986). In fact, the literature reports that 25-75% of people with diabetes are not given exercise advice or a specific exercise prescription by their healthcare provider (Krug et al., 1991; Ruggiero et al., 1997). This lack of advice may be because the complexity of dietary and metabolic control components of diabetes regimen lead to under-emphasis of the physical activity component (Krug et al., 1991; Swift, Armstrong, Beerman, Campbell, & Pond-Smith, 1995). Further, lack of advice may be due to the unclear and not well-understood physical activity guidelines for healthcare providers and diabetes educators (Tudor-Locke, Myers, & Rodger, 2001). As such, findings from this study and others have important implications for treatment protocols, so that people with diabetes can learn important information and skills from health care providers and other support systems.

Notwithstanding, when participants in the sample were asked about learning from others, only some mentioned that this was meaningful. The fact that the majority of participants in the sample engage in physical activity on their own, either due to enjoyment of solitary activity, scheduling demands and geographic location, may partially explain why observational learning is not of personal significance to many. Moreover, only one individual reported using a support group, however, she could not overemphasize how important the support group was for learning new ideas. Gilden, Hendryx, Clar, Cassia, and Singh's (1992) study examined the role of a support group to enhance a diabetes education program and found that the addition of the support group could improve knowledge and psychosocial functioning. As a result, support groups may be an important, yet largely overlooked resource for our sample.

Self-control strategies for physical activity, which included goal setting, self-monitoring and problem solving skills (also termed restructuring plans), were reported by less than half of participants. Further, reinforcement strategies including rewards, were very seldom described. In an attempt to explore these trends, transcripts were re-visited to examine the physical activity behaviours of those who deemed self-control and reinforcement strategies as personally significant and those who did not. Upon re-examination, it was discovered that the majority of those who used self-control and reinforcement were those classified as *active* during leisure-time physical activity. The present study therefore suggests that self-control and reinforcement strategies may only be salient for *active* individuals with type 2 diabetes.

Other studies report similar results, as Kyllo & Landers (1995) meta-analysis suggested that goal setting is predictive of physical activity behaviour. Weber and Wertheim's (1989) study involving self-monitoring also found that individuals who monitored their physical activity behaviour had significantly higher fitness center adherence than those who did not. Further, Simkin and Gross (1994) reported that those who did not maintain an exercise program were less likely to use problem solving skills to overcome barriers than regular exercisers. Consequently, these cognitive and behavioural strategies have important implications for designing and implementing physical activity interventions.

Patterns Across Gender

It appears as though non-leisure/lifestyle physical activity was more personally significant for women than men. Women specifically included activities not mentioned by men, such as occupational activities, living an active lifestyle and playing with children/grandchildren. This finding may reflect women's broader definition of physical activity to include lifestyle activities. This parallels other studies reporting that women may conceptualize the meaning physical activity differently than men, often including housework and caregiving responsibilities (Ainsworth, Richardson, Jacobs, & Leon, 1993; Jacobs, 2000; Marcus et al., 1995).

With regard to the physical environment, women were generally more likely than men to report lack of available facilities. In a study by Brownson and colleagues' (2001), access to parks and facilities, and perceived neighbourhood environment (i.e. sidewalks, enjoyable scenery etc.) were more highly correlated with physical activity among women than men. Nevertheless, findings from this study may reflect the fact that 73% of women in the sample, compared with 44% of men, live in rural areas or towns with a population of less than 10,000. Several studies have, in fact, reported that physical inactivity is highest in rural areas (Brownson et al., 2000; Wilcox, Castro, King, Housemann, & Brownson, 2000). Women living in rural regions are 33% more likely to be completely inactive during leisure-time than women living in urban areas (Brownson et al., 2000; Eyler et al., 2003). Consequently, geographic location may be contributing more to the reported lack of availability than gender.

Gender patterns for self-efficacy, situation and environmental influences also existed. For example, women were more likely to describe low self-efficacy for physical activity when they had other demands on their time. Similarly, only women stated 'other demands on time' as a significant barrier to physical activity, and mentioned the negative anticipated outcome that physical activity would 'take too much time'. Subsequently, a theme emerged that some women felt that they had too many other demands and not enough time, which often made it difficult to participate in regular physical activity.

Other studies suggest that lack of time (Johnson, Corrigan, Dubbert, & Gramling, 1990), family obligations (Verhoef & Love, 1994) and lack of time due to caregiving duties (Brownson, Eyler, King, Brown, Shyu, & Sallis, 2000; Eyler et al., 1998) are commonly reported barriers among women. Additionally, women are more likely to have greater domestic responsibilities in combination with employment outside the home (Johnson et al., 1990), and may often feel they should put their families needs before their own (Cody & Lee, 1999). Consequently, real and/or perceived demands on time may be of great personal significance for several women, which in turn could affect their levels of physical activity participation. Surprisingly, caretaking duties were only mentioned by two women in the present sample. This could be because the average age of women in the sample was 60 years, therefore the majority did not have young children or children living within the household.

Although women may have reported more demands on time from others, it appeared as though they placed more personal significance on a supportive social environment for physical activity (i.e., receiving support from others). Moreover, women were more likely to report watching and learning from others regarding physical activity. This finding reveals that women: 1) actually receive more support and are likely to surround themselves with others, or 2) more easily recall their support and role modeling, or 3) are more willing to talk about the importance of their support and role models. Several studies have reported that the relationship between social support and physical activity tends to be more salient for women than men (Treiber et al., 1991). Further, Troped and Saunders (1998) examined gender differences in social influence and found that women had greater perceived expectations from others to be active and had greater motivation to comply with others.

Notwithstanding, an interesting trend emerged that men talked more in-depth about support from their spouse, not necessarily in terms of physical activity, but for managing their diabetes condition in general. This has been supported by others suggesting that marital support may be particularly important in diabetes management, which often includes spouses in food preparation, medication taking and exercise (Trief et al., 2003). Studies regarding spousal support have varied however, as some conclude that increased spousal report can improve blood glucose control, weight control and stress levels (Gilden, Hendryx, Cassia, & Singh, 1989; Wing, Marcus, Epstein, & Jawad, 1991), while others suggest it can lead to marital friction and negatively effect adherence and control (Peyrot, McMurray, & Hedges, 1988).

Overall, both men and women in the present study felt they had adequate knowledge and skills to perform regular physical activity. However, primarily women reported that they lacked knowledge and skills for appropriate types of activities, strengthening/resistance training, and balancing physical activity with other diabetes self-care behaviours. This has important implications because resistance training is now recommended by the American Diabetes Association (2002) and Canadian Diabetes Association (2003) guidelines for physical activity. As such, more emphasize could be placed on the importance of resistance training as a safe and effective physical activity that people with diabetes can incorporate into their routine.

Patterns Across Socioeconomic Status

For low income individuals in the present study, leisure-time physical activity appeared to be less meaningful than lifestyle/non-leisure activity. Specifically among women, many individuals of low income did not perceive a need to engage in physical activity for the sake of exercising and its related health benefits. Instead, they stated that they only engaged in activities that were necessary or part of their daily activities. Burton and colleagues' (2003) qualitative study of recreational physical activity described similar results, reporting that low and mid SES participants were less likely to identify a personal need to engage it physical activity for positive health. In fact, Burton et al. reported high SES individuals were more likely to prioritize and deem necessary physical activity as a means of physical and psychological improvement.

Further, the limited *leisure-time* physical activity by individuals of low income in this study may be specifically relevant for *women* because of the fact that the sample is slightly older. Perceptions by some older women, for example, may reflect early gender ideology beliefs that leisure activities, such as sport and activities which involve "sweating", are typically viewed as masculine endeavours and do not fit with ideas of femininity (Coakley, 1998; White & Young, 1999).

With regard to observed patterns in self-efficacy, differences across demographic groups were also apparent. For example, individuals of low income reported lower self-efficacy for physical activity when tired, as compared to high income individuals. Although this finding could be related to income, it may be more reflective of age patterning among this population. Low income individuals in this study were typically older than high income individuals, particularly among women. Indeed, the literature suggests that lack of energy and/or being tired (Craig, Russell, Cameron, & Beaulieu, 1998) are commonly reported barriers to physical activity among older adults.

Other patterns of environmental and situational barriers and facilitators were observed between income groups in this study. For example, low income individuals were less likely to mention available facilities. Burton and colleagues' (2003) study demonstrated similar results, reporting that higher SES groups described supportive environments, such as worksite facilities and bike paths, walking trails, gyms and swimming pools. Further, Macintyre, Maciver, and Sooman (1993) objective study of availability of facilities reported an inequitable distribution of recreational facilities in favour of persons living in high SES suburbs.

Further, safety concerns were only personally significant for low income *women.* This parallels Giles-Corti and Donovan's (2002) findings, who reported those living in low socioeconomic areas were less likely to perceive that their neighbourhood was attractive, safe and interesting for walking. Further, one study compared perceived environmental barriers for walking behaviour across gender and found that women were more likely to report not walking if they had concerns about safety and utility within their neighbourhood (Foster, Hillsdon, & Thorogood, 2005).

With regard to one's social environment, patterns existed across SES groups, however they were gender specific. Receiving social support, specifically in the form of companionship, was personally significant for high income men in our study. Burton and colleagues' (2003) found that social influences were more prevalent in mid and high SES groups, as they were more likely to describe encouragement and companionship for recreational physical activity. For women in the present study, receiving companionship from friends was personally significant for those of low income, whereas companionship from family was of greater significance for those of high income. This pattern among women may reflect the fact that more high income women in the study were married or with partner, than low income women. Many high income women did, in fact, mention they participated in physical activity with their spouse. Parks, Housemann, and Brownson (2003) demonstrated similar findings reporting that receiving support from friends was significantly associated with physical activity for low-income urban and low-income suburban, whereas support from relatives was only significant for high-income suburban residents.

Evaluation of perceived situational influences on physical activity revealed that only low income women identified cost as a barrier to physical activity. Estabrooks, Lee, and Gyurcsik (2003) compared pay- and free-for use facilities and reported that low and medium SES neighbourhoods had fewer free-for-use resources and facilities than high SES neighbourhoods. For other situational influences, only individuals of high income reported work schedule/demands as a barrier to physical activity. This is consistent with Burton and colleagues' (2003) study reporting that participants of high SES are more likely than low SES individuals to describe erratic and demanding work schedules. In the present study, however, eight out of the nine low income individuals were currently retired or not working, compared with only one high income individual. These sociodemographic characteristics may have therefore affected observed patterns more so than income characteristics.

Many individuals in this study, specifically those of high income, also described a physical condition that could potentially act as a barrier to physical activity and also reported that aggravating an existing physical condition was an anticipated negative outcome. These results contrast the literature, which often report that low income individuals are more likely to describe poor health and/or low personal functioning as barriers to physical activity (Burton et al., 2003; Parks et al., 2003). Nevertheless, even though high income groups in our study were more likely to report these barriers and negative outcomes, it appears as though it did not affect their physical activity behaviour, as more high income individuals were classified as *active* when compared to those of low income. One possible explanation for this discrepancy is that high income individuals may be more equipped to overcome reported barriers, specifically those related to their health, primarily because of their availability of resources and medical treatment.

Finally, a difference existed across income groups for self-control and reinforcement strategies, specifically for men. For example, several high income men described setting goals, planning ahead and planning alternative strategies for physical activity. Additionally, some high income men reported positively reinforcing their physical activity through the use of rewards. There are several proposed explanations for these findings. First, 80% of high income men, compared to only 25% of low income men were currently working either part- or full-time. Since a greater number of those of high income were currently working, they may have to utilize strategies to plan ahead for physical activity because of their work schedule. Second, the majority of participants stated that they would rather participate in physical activity outdoors whenever possible. The majority of participants who had alternative strategies for physical activity also had home equipment. For example, four men of high income compared to only one man of low income, reported having home equipment. Consequently, men of higher income may have adequate resources to plan alternative strategies for physical activity when they cannot participate outdoors.

Finally, as discussed earlier, a trend was observed that those who were active were more likely to report using self-control and reinforcement strategies. In this sample, 60% of men of high income, compared to 25% of men of low income were considered *active*. Hence, the fact that men of high income were more likely to use these self-control strategies may be more reflective of activity status than income.

Preferences for PA Interventions

Examining physical activity preferences among people with type 2 diabetes is important so that interventions can be tailored to meet their needs and interests. Questions regarding preferences were based upon an "ideal", thus results must be taken with caution. Nevertheless, some interesting gender and income patterns did emerge, which reflect social-cognitive and environmental influences specifically relevant to these groups.

The finding that women tended to prefer a structured or mix of structured/unstructured program adds strength to our earlier SCT findings. For example, women reported lack of motivation and enjoyment for physical activity, thus a structured program may help give direction and incentive. Further, earlier findings of the present study indicated that women were more likely to report using observational learning, therefore reflecting their desire for a structured program where a personal trainer can act as a guide.

An interesting finding was that less than half of the participants wanted any type of intervention tools. This is contradictory to the general population literature, which has suggested that telephone contact is one of the most important support mechanisms for interventions designed to increase physical activity (Sepsis et al., 1995). Moore and Kramer's (1996) study on cardiac rehabilitation preferences also demonstrated that "discussing progress" and "encouragement from professionals" were reported as the most important features of a program for both men and women.

A possible explanation for the apparent lack of interest in intervention tools in the present sample may be because many people with diabetes already receive a large amount of information from other sources (i.e. doctors, diabetes clinics etc.). During the telephone interviews, almost all participants mentioned receiving the Canadian Diabetes Association newsletter and other reading materials. Consequently, people with diabetes may already feel bombarded with information, therefore the idea of more information and contact with health professionals is not appealing.

Consistent with both the general (Booth et al., 1997; Eyler et al., 2003) and diabetic population (Krug et al., 1991; Wanko et al., 2004), moderate walking was reported to be the most preferred type and intensity of activity. This finding is important, as more recent research has demonstrated that moderate intensity may be just as beneficial for health outcomes as higher intensity activity (King, Haskell, Taylor, Kraemer, & DeBusk, 1991; Pate et al., 1995).

Many participants also reported a preference for solitary over group-based activity. This preference for solitary activity parallels others suggesting that middle- and older-aged men and women may actually favour physical activity on one's own or outside of a group setting (King et al., 1991; King & Brassington, 1997; Wilcox, King, Brassington, & Ahn, 1999). Performing solitary physical activity gives an individual greater scheduling and personal control, factors which have been deemed important and influential for physical activity (Moore & Kramer, 1996; Sepsis et al., 1995). Notwithstanding, several women in the sample did report a preference for group activity. This may confirm the earlier SCT finding, that social support and modeling may be personally significant and meaningful for many women. Other studies regarding preferences suggest that programs containing a social component are particularly important for older women (Gil & Overdoef, 1994).

Further, when asked about program format, many participants wanted to engage in home-based activity. This is consistent with others suggesting that activities done in the home are more appealing than those performed in a formal class setting (King et al., 1988; Wilcox et al., 1999). Several studies have also demonstrated that home-based programs are just as effective for producing fitness improvements (King et al., 1988; King et al., 1991), and have similar (van der Bij, Laurant, & Wensing, 2002), or even better adherence rates than group-based programs (King et al., 1991). Nevertheless, the finding that many participants preferred solitary and home-based activities may partially reflect the fact that over half of the participants live in smaller towns and rural areas, where there may be limited access to convenient facilities.

In summary, this study suggests that SCT constructs related to physical activity, and preferences for physical activity interventions, do vary across gender and income groups. It appears as though the SCT offers promise for understanding psychosocial influences on physical activity among people with type 2 diabetes, and for specifically exploring potential patterns across demographic groups. Moreover, uncovering physical activity preferences offers insight to researchers and practitioner so that relevant and meaningful interventions can be designed and implemented for this population.

4.10 Limitations

When reviewing the findings of this study, considerations need to be given to several methodological issues. First, the sample (45%) may have had an over-representation of *active* participants, when compared to Health's Canada's (2002) survey (35%) of physical activity behaviours among people with diabetes. This possible over-representation of those who are adequately active may reflect the fact that participants were self-selected. Consequently, participants who choose to participate may express greater interest in physical activity to begin with, thus effecting representativeness and generalizability.

Second, stratification of income groups were based upon survey results taken at Time 1 of the *ALEXANDRA* study, which used gross family income. The National Council of Welfare (2004) defines income cutpoints in dollars based upon family size and community units, information which we did not have access to at the time of recruitment. Consequently, this needs to be taken into account when drawing conclusions from suggested patterns across income. Moreover, the present study lacks a middle income group comparison, thus limiting our income analysis to upper and lower quartiles of the population.

Third, descriptions and comparisons between each gender/socioeconomic group were based on a small sample. The results present important information for people with type 2 diabetes, and validate certain quantitative results from Study One. However, the small sample size of Study Two may limit the transferability of findings.

Fourth, the interview guide operationalized SCT constructs based upon previous definitions of SCT (Baranowski et al., 2002). However, the interview guide was not extensively pilot tested on a representative sample of people with type 2 diabetes. Further, only the primary researcher was responsible for coding and analyzing data from the interviews. Hence, interview transcripts coded and rated by multiple researchers could strengthen the confirmability of the findings.

4.11 Implications for Future Research

This study brought to light several implications for future research studies, including implications for recruitment, measurement and other methodological issues. First, it was more difficult to recruit participants from lower income groups. There is a general pattern for self-selection sampling within research studies that people who have an interest in the topic at hand may be more likely to volunteer to participate (Trochim, 2001). Within this study, it was found that low income individuals demonstrated a lower number of average minutes in physical activity per week and were more likely to be classified as *inactive*, when compared to high income individuals. This trend is consistent with the general population literature (Crespo, Smit, Andersen, Carter-Pokras, & Ainsworth, 2000; King et al., 1992), and may reflect why it was harder to recruit lower income individuals for physical activity studies. As such, researchers within the field need to continue to improve recruitment strategies for individuals of lower SES to ensure representativeness of research studies.

With regard to the use of the SCT, physical activity research to date has mostly focused on self-efficacy, outcome expectations, and more recently environmental influences. Constructs typically less studied include goal setting, reinforcement and behavioural monitoring. In the present study, goal setting, problem solving, self-monitoring and reinforcements were constructs not meaningful for men of low income, however, more work is warranted to understand these findings. More research is therefore needed to assess how *every* SCT construct influences physical activity behaviour across demographic groups among people with type 2 diabetes.

Moreover, SCT constructs must be assessed in relation to the individual's physical activity behaviour. For example, exploring which constructs are meaningful for people at different stages of readiness for physical activity is beneficial so that intervention materials can be targeting for individual's needs and interests. Additionally, the majority of people in our study engaged in walking as the primary physical activity behaviour. It if therefore important for researchers to understand the psychosocial influences that best explain walking behaviour, as they may differ from psychosocial influences on other forms of leisure-time physical activity.

Furthermore, some of the patterns in our research may have been reflective of age, geographic location and physical activity status in addition to, or in combination with, gender and SES. For example, our sample had an average age of 64 years, and over half of our participants resided in smaller towns or rural areas. It is suggested that social-cognitive and environmental influences may differ for older adults, in comparison to young and middle-aged adults (King, 2001; Washburn, 2000). Moreover, the literature suggests that treatment gaps for diabetes exist in rural regions (Toth et al., 2003), thus it may be fair to assume that gaps for available physical activity materials and programs may also be present. Hence, future studies examining SCT influences on physical activity behaviour could benefit from exploring age and geographic patterning in addition to gender and SES.

Finally, the environmental component of SCT and other ecological models does not provide detailed conceptual tools for assessing environmental influences (Humpel, Owen, & Leslie, 2002). Researchers could potentially benefit from triangulation of methods for assessing environmental influences in future studies. For example, objective measures, such as geographic information systems (GIS), have shown considerable promise and may complement existing self-report measures and descriptive data (Humpel et al., 2002).

4.12 Implications for Practice and Policy

Several findings emerged from this study that have important implications for practice and policy. First, walking was the most frequently reported activity by participants as part of their daily physical activity routine. This finding is especially important for planning interventions among people with type 2 diabetes because research has demonstrated that walking in combination with diet is effective for weight loss and numerous other health outcomes (Brill, Perry, Parker, Robinson, & Burnett, 2002). Further, walking for at least 2 hours a week was associated with 34-39% reduction in all cause and CVD mortality among people with diabetes (Gregg, Gerzoff, Caspersen, Williamson, & Narayan, 2003).

Consequently, walking may be the most feasible and efficient strategy to increase physical activity among all people with type 2 diabetes because it is accessible, low-cost, safe and applicable to various age groups and ability levels (Norman & Mills, 2004). Further, interventions and public physical activity messaging that promote walking and other lifestyle activities may help increase adherence over traditionally prescribed structured programs. Additionally, promoting walking and an active lifestyle may be more relevant and realistic to complement certain demographic, psychosocial and environmental influences.

From an ecological perspective, however, it become apparent that environmental and policy change must occur to facilitate walking for all population subgroups. This includes building and maintaining supportive environments for physical activity, specifically areas to walk that are free of charge, such as walking trails. Free indoor walking facilities, such as mall walking, are also imperative in Canadian society where large fluctuations in weather can affect physical activity participation rates. Moreover, environmental and policy changes which include improving sidewalks, streetlights, safety and traffic regulations may enhance walking and other physical activity endeavours so that people can participate in activity around their home and neighbourhood.

Furthermore, offering worksite facilities may improve availability and access to participate in physical activity. On-site facilities in combination with a supportive workplace culture that encourages physical activity may help individuals who work full-time overcome barriers of time and work schedule/demands. This could include more flexible hours of work, extended lunch hours, and/or on-site childcare, which may be especially relevant for working women with children. Additionally, expanding health benefits so that employees can purchase home equipment or utilize personal trainers as part of their annual allowance, may help to promote physical activity behaviour.

Overall, the present study and others suggested that home-based physical activity is preferred. Home-based activities may be very appealing because they do not require transportation, are relatively low cost, and allow the individual scheduling and personal control (Moore & Kramer, 1996; Sepsis et al., 1995). Physical activity interventions involving interactive communication strategies and or other modern-day technologies offer promise for home-based physical activity interventions. King, Rejeski, and

Buchner (1998) for example, reported that telephone supervision was an effective alternative or complement to on-site instruction for older adults. Additionally, Napolitano and colleagues' (2003) suggest that theoretically-based websites can have a short-term impact on physical activity motivation and behaviour.

Consequently, home-based programs using print material, telephone contact and/or internet programs may be a feasible and effective mode for delivering physical activity interventions to large numbers of people. This may be especially relevant for rural individuals, low income and older individuals, for which cost and access to program/facilities is an issue. Home-based programs also have the potential to include important cognitive and behavioural strategies, such as those deemed as meaningful among individuals in our study.

Self-control and reinforcement strategies were only meaningful for some participants in this study, particularly the more active participants. This study cannot draw conclusions about the direction of this relationship (i.e., whether those who are active utilize more self-control strategies, or whether using self-control strategies encourages greater activity). However, other studies suggest that self-control mediates physical activity behaviour (Hallam & Petosa, 2004), thus self-control strategies should be incorporated into every physical activity intervention. Perhaps a relevant way to do this is through tailoring self-control and reinforcement strategies to individuals' needs, interests and stage of behaviour. For example, McKay and colleagues' "D-Net" (2001) internet intervention (McKay et al., 2001) provided individuals with type 2 diabetes personalized goal-setting, feedback, and problem solving strategies, and participants also received an on-line personal coach and access to peer support group areas. Kirk, Mutrie, MacIntyre, and Fisher (2003) offered intervention participants with type 2 diabetes stage-tailored strategies through one-on one exercise consultations and follow-up reinforcement phone calls. These researchers' results suggest that personalized messages could be effective for behaviour change, with Kirk et al.'s study actually demonstrating significant increases in physical activity behaviour, and improvements in glycemic control and cardiovascular risk factors.

Further, self-monitoring techniques should be promoted to enhance physical activity behaviour because it can provide feedback and act as a motivator, which was one of the most salient barriers for people in this study. For example, Tudor-Locke and colleagues' (2004) "First Step Program" among people with type 2 diabetes utilized self-efficacy, outcome expectations, goal setting and self-monitoring techniques. Pedometer assessments indicated a significant increase in daily walking among the intervention group, which equaled an approximate 31 minutes of extra walking per day. Tudor-Locke and colleagues therefore concluded that the First Step Program is a practical and feasible intervention to promote walking behaviour for sedentary men and women. Consequently, self-monitoring techniques offer promise for promoting physical activity, and can be adapted to income levels ranging from no cost strategies (i.e., logs/diaries) to moderate expense (i.e., pedometers) to high expense (i.e., accelerometers).

Finally, the present study suggested some people with diabetes still feel they lack certain knowledge and do not engage in adequate discussions regarding physical activity with their doctor or health care provider. DiLoreto and colleagues' (2003) assessed the effectiveness of a counseling strategy for physicians to enhance physical activity among people with type 2 diabetes. The intervention group received an additional counseling and follow-up phone calls and appointments to discuss self-efficacy, social support, overcoming barriers and self-monitoring. After 2 years, findings demonstrated that the intervention group increased energy expenditure sevenfold greater than the control group ($p<0.001$). DiLoreto et al.'s study therefore suggests that physicians are in an important position to utilize cognitive and behavioural strategies to promote physical activity among people with type 2 diabetes.

As a result, physicians and other health care providers should be trained to play a more active role in their patient's physical activity behaviour. Specifically, physicians could be trained to assist patients with goal-setting and reinforcing behaviours upon regular visits. Physicians also need to be made more aware of the recommended guidelines for physical activity behaviour for people with type 2 diabetes so they feel confident prescribing physical activity/exercise as a treatment. Moreover, a protocol should be developed to include discussions of physical activity in every diabetes-related visit to the doctor, so that physical activity advice is delivered consistently.

In addition to a more active role by doctors, support groups may also provide important information, advice and feedback for physical activity and other diabetes self-care behaviours. Studies regarding the effectiveness of support groups have shown that support groups can enhance psychosocial functioning and possibly even glycemic control (Gilden et al., 1992). Hence, support groups not only provide important social support but are also important for the processes of role modeling and vicarious experience, which may be especially relevant for women. Further, support groups can vary in their format from group meetings to on-line chat rooms, thereby providing greater flexibility and access to individuals living in rural areas.

4.13 Conclusion

Physical activity behaviour, as defined by leisure and non-leisure activity, varied between men and women, and those of high and low income. As such, interventions to promote physical activity must incorporate activities relevant to these individuals' lives, in order to ensure adherence and success.

Many constructs within the SCT were personally significant for the physical activity behaviours among individuals with type 2 diabetes, however, several noticeable gender and income patterns did exist. Subsequently, understanding these SCT differences, along with suggested preferences gleaned from this research, are important so that tailored interventions can be designed and implemented to meet the needs and interest of these population subgroups. Further, understanding possible differences in SCT constructs and physical activity preferences are also imperative from an ecological perspective, so that environmental and policy level changes reflect meaningful issues among certain population subgroups. The results from this study, although exploratory and descriptive in nature, will potentially contribute to a new understanding of the issues surrounding the promotion of physical activity among people with type 2 diabetes.

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Table 1: Socio-Demographic Characteristics of Sample

		WOMEN		MEN	
	SAMPLE (n=20)	**Low Income (n=5)**	**High Income (n=6)**	**Low Income (n=4)**	**High Income (n=5)**
	M (SD)	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**
Age	64.1 (11.4)	64.6 (6.0)	56.2 (11.2)	70.5 (17.1)	68.0 (7.1)
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Marital Status					
Married/partner	16 (80)	3 (60)	5 (83)	3 (75)	5 (100)
Not married/no partner	4 (20)	2 (40)	1 (17)	1 (25)	0
Employment					
Full-time work	4 (20)	0	1 (17)	1 (25)	2 (40)
Part-time work	7 (35)	0	5 (83)	0	2 (40)
Retired/not working	9 (45)	5 (100)	0 (0)	3 (75)	1 (20)
Population of Town/City					
Rural (<1,000)	4 (20)	2 (40)	1 (17)	0	1 (20)
< 10,000	8 (40)	2 (40)	3 (50)	2 (50)	1 (20)
> 10,000	8 (40)	1 (20)	2 (33)	2 (50)	3 (60)
Physical Activity (PA) Behaviour					
	M (SD)	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**
Weekly Minutes of Strenuous & Moderate Activity	193.4 (205.3)	93.6 (57.6)	210.7 (106.4)	140.8 (162.4)	314.6 (359.2)
Weekly Minutes of Strenuous, Moderate & Mild Activity	326.2 (257.9)	187.6 (144.6)	383.9 (231.2)	300.2 (213.6)	416.5 (392.6)
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Meeting PA Guidelines*					
Active	9 (45)	1 (20)	4 (67)	1 (25)	3 (60)
Inactive	11(55)	4 (80)	2 (33)	3 (75)	2 (40)

* Meeting CDA's recommended guidelines of 150 minutes/week of strenuous and moderate activity

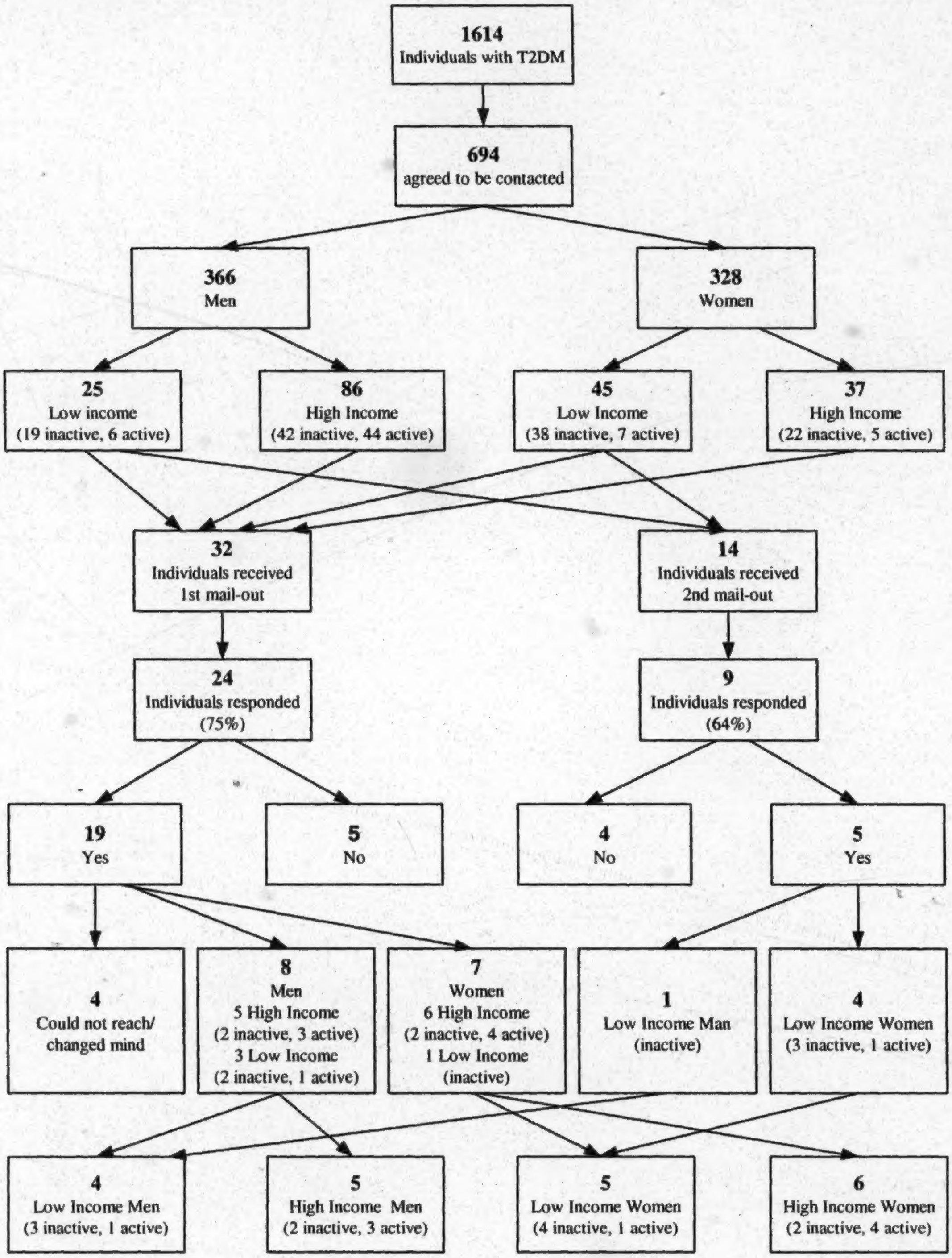
Table 2: Number of Participants Identifying SCT Variables as Personally Relevant to their Physical Activity – By Gender and Income Group

	WOMEN		MEN	
	Low (n=5)	High (n=6)	Low (n=4)	High (n=5)
Current Types of Activities				
Leisure Activities				
Walking outdoors for exercise	2	3	2	2
Walking on treadmill for exercise	-	2	1	1
Jogging or Hiking	-	1	-	2
Strength/Resistance training	-	3	1	1
Classes (aerobic, yoga, aquacise)	-	2	-	1
Sports (golf, bicycling, skating)	-	2	1	3
Non-Leisure/Lifestyle Activities				
Walking for Errands (groceries, mail)	3	-	1	1
Activities of Daily Living (house/yard work)	2	1	2	-
Active Lifestyle (taking the stairs)	-	3	-	-
Activities of Occupation (farming)	-	1	-	-
Playing with Children/grandchildren	1	-	-	-
SCT Constructs				
Self-Efficacy				
High SE for REGULAR PA	5	5	3	4
High SE when BAD WEATHER	2	1	3	3
High SE when TIRED	1	6	1	5
High SE when OTHER DEMANDS	3	1	3	4
Physical Environment (Barriers)				
Facilities not available	4	2	-	1
Bad Weather	4	3	1	2
Physical Conditions				
- uneven ground	1	-	1	1
- stairs	-	-	1	-
Safety				
- traffic	1	-	-	-
- stray dogs	1	-	-	-
Physical Environment (Facilitators)				
Availability of facilities	-	4	1	2
Good Weather	1	1	1	1
Nice scenery	-	1	-	1
Assistive Device (i.e. walker)	1	-	-	-
Social Environment				
Verbal Encouragement				
- From Family	2	3	1	2
- From Friends	-	-	-	-
Assistance (transportation)				
- From Family	1	-	-	-
- From Friends	-	-	-	-
Companionship				
- From Family	1	3	-	2
- From Friends	3	1	1	2

Situation (Barriers)				
Physical condition/disability	2	4	2	3
Diabetes Condition	-	1	1	1
Lack of Motivation	3	2	-	1
Lack of Enjoyment/Boring	1	1	-	1
Cost	2	-	-	-
Too tired	-	1	1	-
Work schedule	-	2	-	2
Old age	-	-	1	-
Self-conscious	-	1	1	-
Other demands				
- children/grandchildren	1	1	-	-
- running errands	2	-	-	-
- cooking	-	1	-	-
Situation (Facilitators)				
Good Physical Health	-	1	-	1
Diabetes Condition	2	3	2	2
Group Atmosphere/Partner	2	2	1	2
Enjoyment	1	-	1	2
Positive Outcome Expectations				
Physical (appearance, strength)	5	6	4	5
Mental (mood, relieves stress)	3	2	2	4
Specific to diabetes				
- blood sugars	5	5	2	4
- weight/management	3	-	1	1
Drink less alcohol	-	-	-	1
Negative Outcome Expectations				
Aggravates physical conditions	-	3	-	1
Stiff/sore muscles and/or joints	-	-	1	2
Effects blood sugar levels	1	-	1	-
Gives me a headache	-	-	1	-
Makes you feel tired	1	1	-	1
Takes too much time	1	1	-	-
Behavioural Capability				
Adequate Knowledge	4	6	4	5
Adequate Skills	3	5	4	5
Sources of Knowledge and Skills:				
- Doctor	2	3	2	1
- Reading	4	5	1	2
- Diabetes Seminars	2	1	1	1
- General Lifelong Learning	1	3	2	3
Knowledge & Skills Lacking:				
- Appropriate activity type	1	1	-	1
- Balancing PA & diet	-	1	-	-
- Strength/resistance training	-	1	-	-
- Foot care for PA	1	-	-	-
Observational Learning				
From peers/family	1	1	-	-
From instructor/personal trainer	-	3	1	1
From tv/videos	-	2	-	1
From support group	1	-	-	-

Self-Control				
Goal setting	2	3	-	2
Problem Solving				
- Planning ahead for PA	2	2	-	2
- Alternative strategies for PA	2	3	-	4
Self-monitoring (log, pedometer)	-	2	-	-
Reinforcements				
Verbal	-	-	-	1
Rewards				
External (i.e. massage, food)	1	2	-	2
Internal (i.e. weight loss)	-	-	-	1
Managing Emotional Arousal				
Managing anxiety by planning ahead/being prepared for possible complications of PA	1	2	-	1
Preferences				
Format				
Structured	4	2	-	-
Unstructured	1	1	3	4
Mix of Structured & Unstructured	-	3	1	1
Tools				
Information Pamphlets	3	-	1	-
Motivational Counseling	-	2	1	-
Body Assessment	-	1	-	-
Participant Makeup				
Own	2	1	3	4
Partner	-	1	-	-
Group (all male/female)	-	3	-	-
Group (mixed gender)	3	1	1	1
Time of Day				
Morning	2	4	3	4
Afternoon	3	-	-	-
Evening	-	1	1	-
Intervals throughout day	-	1	-	1
Intensity				
Light	2	1	1	1
Medium	3	4	1	2
High	-	1	-	2
Location				
In and around home/neighbourhood	2	2	4	5
Facility	3	2	-	-
Mix of home and facility	-	2	-	-

Figure 1: Recruitment Procedures


1614
Individuals with T2DM
694
agreed to be contacted
366
Men
328
Women
25
Low income
(19 inactive, 6 active)
86
High Income
(42 inactive, 44 active)
45
Low Income
(38 inactive, 7 active)
37
High Income
(22 inactive, 5 active)
32
Individuals received
1st mail-out
14
Individuals received
2nd mail-out
24
Individuals responded
(75%)
9
Individuals responded
(64%)
19
Yes
5
No
4
No
5
Yes
4
Could not reach/
changed mind
8
Men
5 High Income
(2 inactive, 3 active)
3 Low Income
(2 inactive, 1 active)
7
Women
6 High Income
(2 inactive, 4 active)
1 Low Income
(inactive)
1
Low Income Man
(inactive)
4
Low Income Women
(3 inactive, 1 active)
4
Low Income Men
(3 inactive, 1 active)
5
High Income Men
(2 inactive, 3 active)
5
Low Income Women
(4 inactive, 1 active)
6
High Income Women
(2 inactive, 4 active)

Chapter Five – Conclusions

5.1 Overview of Chapter

The first part of this chapter summarizes the major findings of Study One and Study Two, and synthesizes the utility of the Social Cognitive Theory (SCT) for people with type 2 diabetes. Recommendations for research, practice and policy are then presented, followed by suggestions for future directions.

5.2 Summary & Synthesis of SCT

Summary of Study One and Study Two

Study One examined survey results (N=1614) to explore whether: 1) physical activity behaviour; and, 2) the strength of potential relationships between physical activity and selected SCT constructs and items, differ for gender, income and education groups. Results revealed that leisure-time physical activity (LTPA), as measured by MET.minutes per week, differed between men and women, and individuals of various income levels. Walking was the most frequently reported LTPA, but the prevalence of this behaviour did not significantly differ within gender, nor income and education groups.

When examining the associations between LTPA and SCT constructs and items, men and women significantly differed in the relationship between LTPA and two self-efficacy items. Significant differences were also revealed for the strength of association between LTPA, and self-efficacy and outcome expectations (at both the construct and item-belief level) between all income groups. Further, significant differences were found in the relationship between LTPA and positive outcome expectations for education groups.

Study Two employed a qualitative approach, conducting telephone interviews (n=20) to explore the meaning and personal significance of SCT constructs related to physical activity for people with type 2 diabetes. This study also had a subsidiary objective to explore preferences for physical activity interventions among this target population. Findings suggest that SCT constructs, such as self-efficacy, environment, situation, outcome expectations, outcome expectancies, behavioural capability, observational learning, self-control, reinforcement, and managing emotional arousal, are meaningful for certain demographic groups. Further, gender and income patterns were noted in preferences for physical activity interventions.

Synthesis of SCT Findings Across Studies

Study One explored the relationship between LTPA and self-efficacy, social support and outcome expectation constructs. However, Study One also assessed the independent influences of item-beliefs on LTPA. This was beneficial because specific item-beliefs may have their own distinct associations with physical activity, which can be masked by the process of scale aggregation to create composite constructs (Rhodes, Plotnikoff, & Spence, 2004). Subsequently, exploring items may offer greater insight into understanding the relationship between SCT variables and physical activity when specifically working with the diabetic population.

Study Two was conducted to provide a contextual understanding of the constructs examined in Study One, and explored additional constructs thereby assessing SCT in its entirety. This was important because several constructs in Study Two (e.g., observational leaning, self-control, reinforcement) have never been assessed with regard to physical activity among this population. Hence, the strength of these complimentary studies lies in this mixed method approach to gain a comprehensive exploration of SCT variables associated with physical activity behaviour.

Both studies explored physical activity behaviour across gender and socioeconomic status (SES) groups. Although this was not a formal research question in Study Two, it did provide useful contextual information that could be used to validate findings from Study One. Moreover, the findings could potentially give direction to the development of future physical activity measures among this population.

Both studies also examined the relationship between physical activity behaviour and SCT variables within gender and SES groups. Overall, the two studies shared some similarities and differences in patterns across demographic groups. For example, in Study One the relationship between LTPA and the self-efficacy construct and several items on the self-efficacy scale, significantly differed for certain income groups. In Study Two, however, the only apparent difference was that individuals of lower income reported less confidence than those of high income to engage in physical activity when they are tired.

One possible explanation for the discrepancy between the two studies across income groups may be related to the wording of the question in Study Two. In Study Two participants were asked about their confidence to participate in physical activity, which was self-defined. In contrast, Study One specifically asked about their confidence to participate in *leisure-time* physical activity. Low income individuals may demonstrate less confidence to participate in *leisure-time* physical activity because of accessibility or availability of resources and/or facilities. However, low income individuals may have equal opportunities to participate in lifestyle or non-leisure activity, thereby explaining why income differences in self-efficacy were less pronounced in Study Two.

With regard to social support, Study One did not demonstrate any differences in the relationship between LTPA and social support for gender and SES groups. This was one major difference between the two studies, as Study Two revealed that women placed more personal significance on a supportive social environment (i.e., receiving support from others for physical activity). Study Two also revealed patterns for social support across income groups, however, they were gender specific. For example, men of high income were much more likely to report receiving support than those of low income. For women, both those of high and low income reported that social support was meaningful for them, but the source of support differed (i.e., friend vs. family). One plausible reason for the inconsistency between studies is that Study One did not assess potential sources of support and different types of support (i.e., emotional, instrumental, informational and appraisal) (Heaney & Israel, 2002). Hence, a suggestion for future quantitative surveys is to include these dimensions of social support for physical activity.

Outcome expectations in Study One did not demonstrate any significant differences for gender. In Study Two, the only gender difference was that women reported a negative expected outcome that physical activity would take too much time. Nevertheless, Study One did demonstrate several differences in the association between LTPA and outcome expectations within income groups. For example, high income individuals demonstrated a stronger positive relationship than low income individuals for LTPA and positive outcome expectations. Additionally, individuals of higher income showed a stronger inverse relationship for LTPA with negative outcome expectations than those of low income. In Study Two, no apparent patterns for income groups existed for outcome expectations. The only exception is that individuals of high income reported the negative expected outcome that physical activity could aggravate existing physical conditions.

A plausible explanation for divergent findings across income groups between Study One and Study Two may be related to the samples. For instance, Study One employed a larger sample size, which may be more reflective of the general diabetic population. Whereas Study Two may reflect a self-selection bias, as those who chose to participate in the interview could have a greater overall interest and awareness of the effects of physical activity, thus resulting in a lack of prominent differences in outcome expectations between income groups.

Strengths of Present Research

To date, there are only a few studies that have assessed demographic differences in social-cognitive constructs associated with physical activity among people with type 2 diabetes. As such, the present results may potentially contribute to a new understanding of the issues surrounding physical activity participation among this population. The particular strength of this research is its triangulation of methods, which serves to validate the findings of each study. Moreover, the use of triangulation in this research has provided insight into methodological considerations and questionnaire development for future studies.

Further, the present research highlights the utility of the SCT among people with type 2 diabetes. For example, SCT may be specifically relevant for use among this population because it includes not only personal factors, but environmental factors that are lacking in other social-cognitive theories. The recognition of environmental variables is important when studying a chronic disease group, such as those with type 2 diabetes, because self-care behaviours of diabetics are very much influenced by one's physical and social environment (Kelly & Booth, 2003; Wing et al., 2001). Additionally, examining the role of environmental factors may be especially important when exploring patterns across socioeconomic status, as it is suggested that individuals of lower SES may have limited access and availability to environmental supports (Macintyre, Maciver, & Sooman, 1993).

Limitations of Present Research

The present research recognizes that more work is needed to validate (both quantitatively and qualitatively) all SCT constructs and items for use in the diabetic population. Additionally, more research is warranted to identify and test constructs and items from additional behaviour change theories. A further limitation of both studies is that significant findings within gender and SES groups may have resulted from confounding variables. These confounding variables were not controlled for, however, they were identified and their implications were discussed within each study.

5.3 Recommendations & Future Directions

Research

Findings from Study One suggest that physical activity behaviours do differ for gender and income groups. As such, research needs to continue to improve physical activity assessment strategies to ensure adequate and accurate assessments of behaviour.

This may include designing questionnaires that assess differing classifications and conceptualizations of physical activity, or using more objective measures of physical activity. Findings from Study Two on preferences for physical activity interventions also suggest that researchers need to continue to test various program formats, modes of delivery and settings. This, in turn, may be useful for reaching larger segments of the population and improving adherence.

Findings from both studies also suggest that researchers should continue to identify mediators and moderators of physical activity. A mediator is an intervening causal variable that may influence the independent variable, thus affecting its relationship with the dependent variable, or it may exert its influence directly on the dependent variable (Baron & Kenny, 1986; Bauman, Sallis, Dzewaltowski, & Owen, 2002). Hence, an increased understanding of the mediators of physical activity will provide information that could help improve the efficacy of interventions (Bauman et al., 2002).

Conversely, a moderator is a variable that can affect the direction and/or strength of the relationship between an independent and dependent variable (Baron & Kenny, 1986; Bauman, Sallis, Dzewaltowski, & Owen, 2002). As such, the relationship between independent and dependent variables may vary across different levels of the moderator (Bauman et al., 2002). Therefore, a better understanding of potential moderators (e.g., age, sex, income) of physical activity behaviour will help researchers and practitioners to tailor interventions for specific subgroups of people (Bauman et al., 2002).

Consequently, more research is needed to understand important mediators and moderators of physical activity, both at the individual and environment-policy level. Future research also needs to be completed in similar populations to verify the results of the studies at hand, and improve the validity and reliability of SCT constructs and items specifically among people with diabetes. Further, validating measures and testing the SCT in ethnic minorities, such as Aboriginal groups, is needed.

Practice

A major finding that emanated from both studies is that walking was the most frequently reported LTPA among all demographic groups. As a result, practitioners should promote walking and other forms of active living for physical activity. Walking, in particular, is generally more applicable to larger segments of the population as it is low-cost, relatively safe, does not require specialized equipment, and can be encouraged for all age and ability levels (Hu, 2003; Norman & Mills, 2004).

Additionally, promoting the use of pedometers may prove to be especially useful for the large amounts of people who walk. Pedometers not only act to measure physical activity behaviour but can also incorporate many social–cognitive strategies to encourage physical activity such as goal-setting, self-monitoring, reinforcement, and self-efficacy (Tudor-Locke et al., 2004). In addition to the use of pedometers, practitioners should encourage other support and feedback tools for physical activity among people with diabetes. The use of support groups for example, gives individuals essential social support and opportunities for observational learning. Support groups may also help to improve knowledge and present opportunities to practice skills, which in turn may improve behavioural capability, and outcome expectations and expectancies.

Further, the fact that gender and SES differences were observed for the relationship between LTPA and self-efficacy, and environmental and situational influences, suggests that interventions should be designed to cater to these differences rather than promoting a "one-size" fits all approach. As a result, interventions should be tailored to meet the needs and interests of these demographic groups. Several studies have shown that tailored messages and materials are more likely to be read, remembered and discussed with others (Clark, Hampson, Avery, & Simpson, 2004). Additionally, tailored materials appear to be more efficacious than generic materials for producing physical activity behaviour change (Marcus, Emmons et al., 1998; Marcus, Nigg, Riebe, & Forsyth, 2000).

Targeting refers to identifying a population group based upon on a common characteristic, for example gender, income, ethnicity and even stage of physical activity readiness (Napolitano & Marcus, 2002). Conversely, tailoring reaches one specific person, thus providing materials that meet the needs and interests of each individual (Napolitano & Marcus, 2002). Physical activity interventions thus far have used targeted and tailored print materials based upon SCT and TTM and have demonstrated success within the general population (Marcus, Bock et al., 1998; Marcus, Emmons et al., 1998). Physical activity interventions using targeted and tailored materials among people with diabetes are limited, but preliminary research shows that it may also have potential (Clark et al., 2004; Kim, Hwang, & Yoo, 2004).

Finally, practitioners should be committed to designing physical activity interventions in a variety of settings to increase physical activity initiation and adherence. Study Two revealed that many individuals prefer a home-based program. Home-based programs offer the opportunity to promote walking and lifestyle physical activity, while still incorporating behavioural strategies thorough telephone counseling and internet programs. The internet, in fact, may offer the most promise for delivering behavioural strategies and promoting physical activity, as it is suggested that 56% of adults in the US have internet access, and of those who use the internet, 55% access health or medical information (Napolitano et al., 2003).

Further, community-based and workplace interventions offer a chance to increase awareness and knowledge, and provide environmental supports and role models. The workplace is now widely suggested as an opportune setting to increase awareness and knowledge, because it reaches large amounts of people and can utilize different modes of delivery such as emails, newsletters, posters, workshops, and lunch and learn seminars (Plotnikoff, McCarger, Wilson, & Loucaides, 2005).

Policy

Findings from this research highlight the need to recommend policy change to encourage physical activity behaviour. For example, providing supportive physical and social environments for physical activity was meaningful for many participants within Study Two. Therefore, policies that regulate the use of land for physical activity endeavours, or improvement of existing infrastructures for physical activity (e.g., sidewalks, walking trials) should be a priority. Additionally, policies to improve the availability and accessibility of facilities, or offer subsidized or tax incentives for gym memberships or home equipment may prove useful. Moreover, policies at the workplace that accommodate flexible hours and expanding wellness accounts may help facilitate physical activity behaviour.

For doctors, nurses and diabetes educators, there is also a need to promote more thorough discussions with patients about the role of physical activity for effective diabetes management. Study Two suggested that many individuals did not feel they received enough information from their health care providers about the role of physical activity. Having policies in place may therefore promote practitioner use of clinical guidelines and may help to develop a more consistent treatment protocol for physical activity in the treatment of diabetes.

Future Directions

Physical activity is one of the cornerstones of effective prevention and management of type 2 diabetes. Physical activity can help improve glycemic control and decrease cardiovascular risk factors (Boule, Kenny, Haddad, Wells, & Sigal, 2003; Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (CDA), 2003). It is also suggested that physical activity can improve quality of life for those living with the disease (Glasgow, Ruggiero, Eakin, Dryfoos, & Chobanian, 1997). Unfortunately, it is reported that over half of those with type 2 diabetes are insufficiently active to achieve health benefits (Health Canada, 2002).

For researchers, practitioners and policy makers it is important to understand psychosocial influences on physical activity, and examine whether these influences differ based upon sociodemographic characteristics. Yet, physical activity is only one lifestyle behaviour that may contribute to successful prevention and management of type 2 diabetes. Researchers therefore need to explore personal and environmental influences for all lifestyle behaviours, including diet, smoking, medication taking and physical activity. Further, practitioners should design interventions that can simultaneously promote all essential diabetes self-care behaviours.

In summary, it is imperative to promote physical activity, diet and weight loss strategies among people with diabetes and those at risk, to assist them in modifying and/or improving current lifestyle behaviours. This is in light of the fact that diabetes prevalence in Canada is projected to increase from 1.4 million in 2000 to approximately 2.4 million in 2016 (Ohinmaa, Jacobs, Simpson, & Johnson, 2004). Accompanying this increase in prevalence will be an approximate 75% rise in both direct and indirect health care costs attributable to diabetes (Ohinmaa et al., 2004). This will greatly affect the already overburdened Canadian health care system. Nevertheless, cost analysis studies report that when compared to pharmacological interventions, lifestyle interventions provide greater health benefits and lower costs for preventing diabetes among those at risk (Herman et al., 2005).

Consequently, promoting physical activity and other positive lifestyle behaviours through the use of information and resources targeted and tailored to demographic characteristics, psychosocial and environmental influences, and level of readiness for change, may offer promise for curbing the potential diabetes epidemic. In turn, successful interventions will not only contribute to decreased complications and improved quality of life for those living with diabetes, but will greatly affect family, friends and society at large.

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Appendix I:

Study One Instruments

TIME 1

Diabetes and Physical Activity Study

About This Study

This confidential questionnaire is about what people who have diabetes think, feel, and do about physical activity. There are no right or wrong answers to any of these questions. Please listen to the questions carefully and answer each one according to what is true for you. This is a very thorough questionnaire and some questions may appear similar to each other. Please answer each question to the best of your ability and please do not skip any questions.

Has a doctor or nurse ever told you that you have diabetes?

Yes ______

No ______

A small group already has completed this survey by mail. If you recently completed a diabetes and physical activity survey by mail you do not have to participate in this telephone survey.

Yes ______ I have already completed a diabetes and physical activity survey by mail.

Centre for
Health Promotion
STUDIES

University
of
Alberta

Faculty of Physical Education & Recreation

Section A

1. For this first question, we would like you to recall your average weekly participation in physical activity over the past month. How many times per week on average did you do the following kinds of physical activity during your free time over the past month?

When answering these questions please:

- Consider your average over the past month.
- Only count physical activity sessions that lasted 10 minutes or longer in duration.
- Do not count physical activity that was done as part of your employment or household chores.
- Note that the main difference between the three categories below is the intensity of the physical activity.
- Please write the average amount of times per week on the first line and the average time on the second line.

	Times Per Week	Average Time Per Session (minutes)
A. Strenuous physical activity (heart beats rapidly, sweating) (e.g., running, jogging, hockey, soccer, squash, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling, vigorous aerobic dance classes, heavy weight training)		
B. Moderate physical activity (not exhausting, light perspiration) (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)		
C. Mild physical activity (minimal effort, no perspiration) (e.g., easy walking, yoga, archery, fishing, bowling, lawn bowling, shuffleboard, horseshoes, golf, snowmobiling)		

2. Is the amount of activity you did in the past month less, more, or about the same as your usual physical activity habits?

I am now much less active	*I am now less active*	*I am now about the same*	*I am now more active*	*I am now much more active*
1	2	3	4	5

3. In the past month, was your participation in physical activities limited by a health condition, injury, or disability?

☐ No ☐ Yes If yes: How much did this limit you from getting physical activity?

Slightly	*A little*	*Somewhat*	*Quite a lot*	*Completely*
1	2	3	4	5

4. During the past 12 months, have you spent more than one week confined to a bed or chair as a result of an injury, illness, or surgery?

☐ No ☐ Yes If yes, how many weeks in the last 12 months were you confined to a bed or chair? _______weeks

5. Do you have difficulty doing any of the following activities:

Getting in or out of a bed or a chair? ☐ No ☐ Yes
Walking across a small room without resting? ☐ No ☐ Yes
Walking for 10 minutes without resting? ☐ No ☐ Yes

6. How active are you at work on most days?

☐ Do not work
☐ Sedentary (mostly sitting or standing)
☐ Moderately active (walking, light lifting, packing, etc., some of the time)
☐ Active (walking, lifting/carrying, half of the time or more)
☐ Very active (walking more than half the time, lifting/carrying heavy objects, shoveling etc...)

7. When you were between the ages of 12 and 17, how much regular physical activity did you get?

None	*A little*	*A moderate amount*	*Quite a lot*	*A great deal*
1	2	3	4	5

The remaining sections in this study ask about your beliefs and behaviours on doing *"regular physical activity"*. *"Regular physical activity"* is defined as doing activities such as brisk walking, recreation, and sporting activities (e.g. jogging, swimming, bicycling, skiing) all at a moderate intensity of a brisk walking pace (or faster). These free-time activities do not include household chores or physical labor on the job.

For moderate activity to be regular, your activity must:

- **add up to a total of 30 minutes or more per day**
- **be done at least 4 days per week**

There are a number of ways that you could reach your 30 minute total. You could, for example:

- **take a half-hour brisk walk or bicycle ride**

  or

- **take three, 10-minute periods of activities; such as a brisk walk for 10 minutes, swimming for 10 minutes and climbing stairs for exercise for 10 minutes, all in the same day**

Section B

Please choose the description that best describes your present physical activity behaviour. Remember regular physical activity equals doing physical activity at least 4 days a week, for 30 minutes each day, at a moderate intensity of a brisk walking pace (or faster).

☐ I presently ***do not get*** regular physical activity and do not plan to do so in the next 6 months

☐ I presently ***do not get*** regular physical activity, but I have been thinking about doing so within the next 6 months.

☐ I presently ***do not get*** regular physical activity, but I plan to in the next 30 days.

☐ I presently ***get*** regular physical activity, but I have only begun doing so within the past 6 months.

☐ I presently ***get*** regular physical activity and have been doing so for longer than 6 months.

Section C

The following questions are specific to diabetes and regular physical activity.

38. Do you think regular physical activity provides benefits for people with diabetes?

Definitely not	***Probably not***	***Unsure***	***Probably yes***	***Definitely yes***
1	2	3	4	5

39. How important do you think regular physical activity is for controlling your diabetes?

Not at all important	***A little important***	***Somewhat important***	***Quite important***	***Very important***
1	2	3	4	5

40. Do you think regular physical activity will reduce your chances of having further diabetes problems?

Definitely not	***Probably not***	***Unsure***	***Probably yes***	***Definitely yes***
1	2	3	4	5

41. Does the fear of low blood sugar reaction limit your physical activity?

Definitely not	***Probably not***	***Unsure***	***Probably yes***	***Definitely yes***
1	2	3	4	5

42. Do you use regular physical activity as a way to manage your weight?

Not at all	***A little***	***Somewhat***	***Quite a lot***	***Very much***
1	2	3	4	5

Section D

The next questions ask how confident you are about doing regular physical activity in different circumstances. Please choose only one response for each question.

In the next 6 months I am confident that I can participate in regular physical activity:

		Not at all confident	*Not very confident*	*Moderately confident*	*Very confident*	*Extremely confident*
1.	When I am a little tired.	1	2	3	4	5
2.	When I am in a bad mood or feeling depressed.	1	2	3	4	5
3.	When I have to do it by myself.	1	2	3	4	5
4.	When it becomes boring.	1	2	3	4	5
5.	When I can't notice any improvements in my fitness.	1	2	3	4	5
6.	When I have many other demands on my time.	1	2	3	4	5
7.	When I feel a little stiff or sore.	1	2	3	4	5
8.	When the weather is bad.	1	2	3	4	5
9.	When I have to get up early, even on weekends.	1	2	3	4	5
10.	When I have diabetes complications.	1	2	3	4	5
11.	When I have to find different activities due to diabetes complications.	1	2	3	4	5
12.	When I feel a little ill.	1	2	3	4	5
13.	When I have to let others know I have diabetes.	1	2	3	4	5

14. **On a scale of 0% to 100%, how likely is it that you will get regular physical activity within the next 6 months?**

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

15. **Currently, have you thought about it and decided not to do any regular physical activity?** ☐ **Yes** ☐ **No**

Section E

To what extent will the following ideas influence your decision to do regular physical activity over the next 6 months?

Remember, the questions are not asking how much you agree or disagree with these statements, but rather how much each may influence your decision to do regular physical activity over the next 6 months:

	Over the next 6 months:	*Not at all*	*A little*	*Somewhat*	*Quite a lot*	*Very much*
1.	Physical activity would help me reduce tension or manage stress.	1	2	3	4	5
2.	I would feel more confident about my health by getting regular physical activity.	1	2	3	4	5
3.	I would sleep better.	1	2	3	4	5
4.	Physical activity would take too much of my time.	1	2	3	4	5
5.	I would have less time for my family and friends if I participated in physical activity.	1	2	3	4	5
6.	I'd be too tired to get physical activity because of my other daily responsibilities.	1	2	3	4	5
7.	Physical activity would help me have a more positive outlook.	1	2	3	4	5

Remember, the questions are not asking how much you agree or disagree with these statements, but rather how much each may influence your decision to do regular physical activity over the next 6 months:

8.	Physical activity would help me control my weight.	1	2	3	4	5
9.	I'd worry about looking awkward if others saw me being physically active.	1	2	3	4	5
10.	Participating in physical activity would cost too much money.	1	2	3	4	5
11.	Regular physical activity would decrease my chances of having further diabetes complications.	1	2	3	4	5

Over the next 6 months:		*Not at all*	*A little*	*Somewhat*	*Quite a lot*	*Very much*
12.	Regular physical activity would help control my glucose level.	1	2	3	4	5
13.	Regular physical activity would require that I monitor my blood glucose levels more closely.	1	2	3	4	5
14.	Regular physical activity may lead to an insulin reaction.	1	2	3	4	5
15.	Regular physical activity will require me to let others know I have diabetes.	1	2	3	4	5
16.	Regular physical activity will require me to rely on others if complications occur.	1	2	3	4	5
17.	Regular physical activity would cause me physical injury.	1	2	3	4	5

Section F

During the past month, how often have you had any of the thoughts, experiences, feelings, or activities described by each of the following statements.

How often in the past month:		*Never*	*Seldom*	*Occasionally*	*Often*	*Very often*
1.	Did warnings about the health problems caused by inactivity concern you?	1	2	3	4	5
2.	Did you feel you would be a good role model for others if you were getting regular physical activity?	1	2	3	4	5
3.	Did you notice society changing in ways that make it easier to get regular physical activity?	1	2	3	4	5
4.	Did you think that you would be achieving an important personal goal if you were getting regular physical activity?	1	2	3	4	5
5.	Did you ask someone to help you improve your physical activity skills?	1	2	3	4	5

How often in the past month:		*Never*	*Seldom*	*Occasionally*	*Often*	*Very often*
6.	Did you use physical activity to help relieve your stress instead of just worrying about your stress?	1	2	3	4	5
7.	Did you read anything about physical activity to learn more about it?	1	2	3	4	5
8.	Did warnings about physical inactivity being bad for your health worry you?	1	2	3	4	5
9.	Did you feel you were letting yourself down if you didn't get regular physical activity?	1	2	3	4	5
10.	Did you set physical activity goals for yourself that you could reach?	1	2	3	4	5
11.	Did you make sure you have the things you needed in order to get regular physical activity?	1	2	3	4	5
12.	Did you talk to anyone and/or attend a session about the importance of regular physical activity?	1	2	3	4	5
13.	Did you think that you could influence others to be healthier if you were getting regular physical activity?	1	2	3	4	5
14.	Did you notice that the health care system was encouraging patients to get regular physical activity?	1	2	3	4	5
15.	Did you get your regular physical activity instead of doing something else?	1	2	3	4	5
16.	Did you ask someone to give you feedback about your regular physical activity?	1	2	3	4	5
17.	Did you tell yourself that taking care of your body through regular physical activity was a personal accomplishment?	1	2	3	4	5
18.	Did you ask someone to do physical activity with you?	1	2	3	4	5

How often in the past month:		*Never*	*Seldom*	*Occasionally*	*Often*	*Very often*
19.	Did you intentionally keep things around your home or workplace to remind you to get regular physical activity?	1	2	3	4	5
20.	Did you plan how you would get regular physical activity?	1	2	3	4	5
21.	Did you remind yourself about a commitment to get regular physical activity?	1	2	3	4	5
22.	Did you tell yourself that getting regular physical activity was preventing diabetes complications?	1	2	3	4	5

Section G

The following are ways that you might feel about diabetes and physical activity. How much do you agree that each of the following statements represents your thoughts about doing regular physical activity over the next 6 months.

		Definitely not	*Probably not*	*Unsure*	*Probably yes*	*Definitely yes*
1.	Getting further diabetes complications would be a very bad thing to happen to me.	1	2	3	4	5
2.	I am frightened about the possibility of getting further diabetes complications.	1	2	3	4	5
3.	My chances of getting further diabetes complications are small.	1	2	3	4	5
4.	For me, physical activity will keep me healthy.	1	2	3	4	5
5.	For me, physical activity will help me either remain fit or get fit.	1	2	3	4	5
6.	For me, physical activity will reduce my chances of getting serious health problems.	1	2	3	4	5
7.	I have easy access to places where I can get physical activity.	1	2	3	4	5

Section H

For each of the following statements, please select the word that best represents how you feel about doing regular physical activity over the next 6 months.

For me regular physical activity is:

1.	**Quite enjoyable**	**Slightly enjoyable**	**Neutral**	**Slightly unenjoyable**	**Quite unenjoyable**
2.	**Quite useful**	**Slightly useful**	**Neutral**	**Slightly useless**	**Quite useless**
3.	**Quite wise**	**Slightly wise**	**Neutral**	**Slightly foolish**	**Quite foolish**
4.	**Quite interesting**	**Slightly interesting**	**Neutral**	**Slightly boring**	**Quite boring**
5.	**Quite relaxing**	**Slightly relaxing**	**Neutral**	**Slightly stressful**	**Quite stressful**
6.	**Quite beneficial**	**Slightly beneficial**	**Neutral**	**Slightly harmful**	**Quite harmful**

Section I

How much do you agree or disagree with each statement, choose the number which matches your answer. Not applicable is represented by N/A.

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	
1. Most people in my social network want me to do regular physical activity in the next 6 months.	1	2	3	4	5	
2. Most people in my social network would approve if I did regular physical activity in the next 6 months.	1	2	3	4	5	
3. My doctor or health care provider wants me to participate in regular physical activity in the next 6 months.	1	2	3	4	5	
4. My doctor or health care provider would approve for me to get regular physical activity in the next 6 months.	1	2	3	4	5	
5. Most of my family members participate in regular physical activity.	1	2	3	4	5	
6. Most of my friends participate in regular physical activity.	1	2	3	4	5	
7. My spouse/partner participates in regular physical activity.	1	2	3	4	5	N/A
8. Most of my co-workers participate in regular physical activity.	1	2	3	4	5	N/A

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
9.	People in my social network are likely to help me participate in regular physical activity.	1	2	3	4	5
10.	There is no one in my social network who I can turn to for assistance with regular physical activity.	1	2	3	4	5
11.	I feel that someone in my social network will provide the support I need in order to be regularly physically active.	1	2	3	4	5
12.	Whether or not I participate in regular physical activity is mostly up to me.	1	2	3	4	5
		Absolutely no control	A little control	Some control	A lot of control	Complete control
13.	How much personal control do you feel you have over participating in regular physical activity in the next 6 months?	1	2	3	4	5
		Not at all	A little	Moderately	Quite a lot	Very much
14.	How much do you feel that participating in regular physical activity is beyond your control in the next 6 months?	1	2	3	4	5

Choose the description that best describes your total physical activity behaviour that you get during your leisure time, household chores, and worktime. Remember regular physical activity equals doing physical activity at least 4 days a week, for 30 minutes each day, at a moderate intensity of a brisk walking pace (or faster).

☐ I presently ***do not get*** regular physical activity and do not plan to do so in the next 6 months.

☐ I presently ***do not get*** regular physical activity, but I have been thinking about doing so within the next 6 months.

☐ I presently ***do not get*** regular physical activity, but I plan to in the next 30 days.

☐ I presently ***get*** regular physical activity, but I have only begun doing so within the past 6 months.

☐ I presently ***get*** regular physical activity and have been doing so for longer than 6 months.

During a usual week about how often do you do physical exercise in your free time for at least 20 minutes without stopping, which is hard enough to make your heart rate and breathing increase a large amount?

________ TIMES per week

Section J

The next questions ask about other health behaviours. Please choose one response for each question.

		Yes, for more than 6 months	Yes, for less than 6 months	No, but I intend to within the next 30 days	No, but I intend to within the next 6 months	No, and I do not intend to within the next 6 months
1.	Do you normally choose to buy low-fat versions instead of high-fat versions of food?	1	2	3	4	5
2.	Do you normally cook your meals using techniques to reduce fat?	1	2	3	4	5
3.	Do you normally prepare your food at the table in ways that reduce fat?	1	2	3	4	5
4.	In general, do you consistently avoid eating high-fat foods?	1	2	3	4	5

The next questions ask about your eating habits over the past week. Choose one response for each question (i.e., the number of days). Non applicable = N/A

On how many of the last seven days:

1.	Have you followed a healthy diet?	0	1	2	3	4	5	6	7	
2.	Did you eat five or more servings of vegetables and fruits?	0	1	2	3	4	5	6	7	
3.	Did you eat high fat foods such as processed meat or full-fat dairy products?	0	1	2	3	4	5	6	7	
4.	Did you space carbohydrates (e.g. bread, rice, potatoes) evenly through the day?	0	1	2	3	4	5	6	7	
5.	On average, over the past month, how many days per week have you followed your eating plan?	0	1	2	3	4	5	6	7	N/A

The next questions ask about foot care. Choose one response for each question.

1.	**On how many of the last seven days did you check your feet for sores, redness, cuts, etc.?**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2.	**On how many of the last seven days did you inspect the inside of your shoes?**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

The next questions ask about your prescribed medication habits. Choose one response for each question. Non applicable = N/A

1. Are you currently on diabetes medication? ☐ **Yes** ☐ **No**

2.	**On how many of the last seven days did you take your recommended diabetes medication?**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**N/A**

The next questions ask about your smoking habits. Choose one response for each question.

1. Do you currently smoke cigarettes?

☐ Yes → How many cigarettes do you usually smoke a day? ______

☐ No → Have you ever smoked cigarettes? ☐ Yes ☐ No

The next questions ask about your medical and health background.

1. Has a close blood relative (e.g. a parent, brother, or sister) ever had heart disease (e.g. heart attack, stroke, and/or angina) before the age of 60?

☐ Yes ☐ No

2. Has a doctor or nurse ever told you that you have had the following:

a. Angina ☐ Yes ☐ No

b. Heart attack ☐ Yes ☐ No

c. Stroke ☐ Yes ☐ No

d. High blood cholesterol ☐ Yes ☐ No

e. High blood pressure ☐ Yes ☐ No

3. At what age were you diagnosed with diabetes? _______years

4. What type of diabetes have you been told you have?

☐ Type 1 or juvenile or insulin dependent diabetes

☐ Type 2 or mature onset or non-insulin dependent diabetes

☐ I don't know / not sure

5. Are you taking insulin everyday for your diabetes now?

☐ Yes ☐ No

6. Are you taking diabetes pills everyday for your diabetes now?

☐ Yes ☐ No

7. Did you start taking insulin every day during the first year of learning you had diabetes?

☐ Yes ☐ No

8. Did you start taking diabetes pills every day during the first year of learning you had diabetes?

☐ Yes ☐ No

Section K

The final part of the questionnaire is needed to help understand the characteristics of the people participating in this study and is very important information. All information received is held in strict confidence and its presentation to the public will be group data only.

1. Age ________ (years)

2. Male ________ Female ________

3. Ethnic Origin:
Canadian ________ European ________
Arab ________ Aboriginal ________
Asian ________ Latin, South American ________
African ________ Other (please specify) ________________

4. Marital Status:
Never Married ________ Married ________
Common Law ________ Widowed ________
Separated or Divorced ________

5. Education:
Some Grade School ________
Some High School ________
Completed High School ________
Some University / College ________
Completed College / University ________
Some Graduate School ________
Completed Graduate School ________

6. Gross Annual Family Income:
<$20,000 ________
$20,000-39,999 ________
$40,000-59,999 ________
$60,000-79,999 ________
$80,000-99,999 ________
Over $100,000 ________

7. Employment Status:
Homemaker ________
Full-Time Paid ________
Part-Time Paid ________
Retired ________
Temporarily Unemployed ________
Volunteer ________

8. Height and Weight Information:

Weight in pounds ________ OR in kilograms ________

Height in feet/inches ________ OR meters/centimeters ________

Thank you for your time and participation today.
We will be telephoning you again in 6 months time to ask a similar set of questions.

TIME 2

Diabetes and Physical Activity Study

About This Study

In May 2002 you were mailed a questionnaire about what people who have diabetes think, feel, and do about physical activity. Thank you for taking the time to complete the questionnaire and provide your feedback. The study requires participants to complete two questionnaires at six months apart. The following is the second questionnaire for this study. The Researcher has added new questions and made some changes based on the feedback received from participants.

Please read the questions carefully and answer each one according to what is true for you. There are no right and wrong answers to any of these questions. This is a very thorough questionnaire and some questions may appear similar to each other. Please answer each question to the best of your ability and please do not skip any questions.

Centre for
Health Promotion
STUDIES

University
of
Alberta

Faculty of Physical Education & Recreation

Section A

To start, we are going to ask about all the physical activity which you might do. We need to know if you have done each of these activities in the past 2 weeks.

		How many times in the past 2 weeks did you do the activity listed?	On average, how many minutes did you spend each time?	What usually happened to your heart rate or breathing when you did the activity? Did you have a small, moderate, or large increase, or no increase at all in your heart rate or breathing?			
For Example:			Minutes	None	Small	Medium	Large

If you went swimming 3 times in the past 2 weeks for 45 minutes each time, you would respond this way

Swimming							
	Yes ☑	3	45	☐	☐	☑	☐
	No ☐						

If you did not swim in the past 2 weeks, check "no", and go on to the next activity / question.

Swimming							
	Yes ☐→			☐	☐	☐	☐
	No ☑						

		How many times in the past 2 weeks did you do the activity listed?	On average, how many minutes did you spend each time?	What usually happened to your heart rate or breathing when you did the activity? Did you have a small, moderate, or large increase, or no increase at all in your heart rate or breathing?			
			Minutes	**None**	**Small**	**Medium**	**Large**
1. **Walking for exercise**							
	Yes ☐ →			☐	☐	☐	☐
	No ☐						
2. **Jogging or treadmill**							
	Yes ☐ →			☐	☐	☐	☐
	No ☐						
3. **Exercise or aerobics classes**							
	Yes ☐ →			☐	☐	☐	☐
	No ☐						
4. **Machine exercises at home (for example, stationary bicycle)**				☐	☐	☐	☐
	Yes ☐						
	No ☐						

			How many times in the past 2 weeks did you do the activity listed?	On average, how many minutes did you spend each time?	What usually happened to your heart rate or breathing when you did the activity? Did you have a small, moderate, or large increase, or no increase at all in your heart rate or breathing?			
				Minutes	None	Small	Medium	Large
5.	**Non-machine exercises at home** (for example, aerobics or other exercise that makes you breathe harder)							
	Yes	☐ →	└─┴─┘	└─┴─┴─┘	☐	☐	☐	☐
	No	☐						
6.	**Downhill skiing**							
	Yes	☐ →	└─┴─┘	└─┴─┴─┘	☐	☐	☐	☐
	No	☐						
7.	**Cross-country skiing**							
	Yes	☐ →	└─┴─┘	└─┴─┴─┘	☐	☐	☐	☐
	No	☐						
8.	**Ice skating**							
	Yes	☐ →	└─┴─┘	└─┴─┴─┘	☐	☐	☐	☐
	No	☐						
9.	**Ice hockey**							
	Yes	☐ →	└─┴─┘	└─┴─┴─┘	☐	☐	☐	☐
	No	☐						
10.	**Swimming**							
	Yes	☐ →	└─┴─┘	└─┴─┴─┘	☐	☐	☐	☐
	No	☐						
11.	**Tennis**							
	Yes	☐ →	└─┴─┘	└─┴─┴─┘	☐	☐	☐	☐
	No	☐						
12.	**Squash or racquetball**							
	Yes	☐ →	└─┴─┘	└─┴─┴─┘	☐	☐	☐	☐
	No	☐						
13.	**Cycling** (outdoors or at a fitness facility)							
	Yes	☐ →	└─┴─┘	└─┴─┴─┘	☐	☐	☐	☐
	No	☐						
14.	**Bowling**							
	Yes	☐ →	└─┴─┘	└─┴─┴─┘	☐	☐	☐	☐
	No	☐						

		How many times in the past 2 weeks did you do the activity listed?	On average, how many minutes did you spend each time?	What usually happened to your heart rate or breathing when you did the activity? Did you have a small, moderate, or large increase, or no increase at all in your heart rate or breathing?			
			Minutes	None	Small	Medium	Large
15. Stair climbing for physical activity							
Yes	☐ →	☐☐	☐☐☐	☐	☐	☐	☐
No	☐						
16. Basketball or soccer							
Yes	☐ →	☐☐	☐☐☐	☐	☐	☐	☐
No	☐						
17. Dancing – popular, ballet, modern		☐☐	☐☐☐	☐	☐	☐	☐
Yes	☐ →						
No	☐						
18. Yoga or Tai Chi							
Yes	☐ →	☐☐	☐☐☐	☐	☐	☐	☐
No	☐						
19. Stretching Exercises							
Yes	☐ →	☐☐	☐☐☐	☐	☐	☐	☐
No	☐						
20. Badminton							
Yes	☐ →	☐☐	☐☐☐	☐	☐	☐	☐
No	☐						
21. Golf							
Yes	☐ →	☐☐	☐☐☐	☐	☐	☐	☐
No	☐						
22. Gardening							
Yes	☐ →	☐☐	☐☐☐	☐	☐	☐	☐
No	☐						
23. Weightlifting or other exercise to increase muscle strength							
Yes	☐ →	☐☐	☐☐☐	☐	☐	☐	☐
No	☐						

		How many times in the past 2 weeks did you do the activity listed?	On average, how many minutes did you spend each time?	What usually happened to your heart rate or breathing when you did the activity? Did you have a small, moderate, or large increase, or no increase at all in your heart rate or breathing?			
			Minutes	None	Small	Medium	Large
24. Being physically active while playing with children *(other than the activities already mentioned)*	Yes ☐ → No ☐	└┴┘	└┴┴┘	☐	☐	☐	☐
25. Household chores	Yes ☐ → No ☐	└┴┘	└┴┴┘	☐	☐	☐	☐
26. Yardwork / shoveling snow	Yes ☐ → No ☐	└┴┘	└┴┴┘	☐	☐	☐	☐
27. Moving, pushing, and lifting heavy objects at work	Yes ☐ → No ☐	└┴┘	└┴┴┘	☐	☐	☐	☐
28. Walking at work	Yes ☐ → No ☐	└┴┘	└┴┴┘	☐	☐	☐	☐
29. Other: (specify)______________		└┴┘	└┴┴┘	☐	☐	☐	☐
30. Other: (specify)______________		└┴┘	└┴┴┘	☐	☐	☐	☐
31. Other: (specify)______________		└┴┘	└┴┴┘	☐	☐	☐	☐

Section B

1. For this first question, we would like you to recall your average weekly participation in physical activity over the past month. How many times per week on average did you do the following kinds of physical activity during your free time over the past month?

When answering these questions please:

- Consider your average over the past month.
- Only count physical activity sessions that lasted 10 minutes or longer in duration.
- Do not count physical activity that was done as part of your employment or household chores.
- Note that the main difference between the three categories below is the intensity of the physical activity.
- Please write the average amount of times per week on the first line and the average time on the second line.

	Times Per Week	Average Time Per Session (minutes)
A. **Strenuous physical activity** (heart beats rapidly, sweating) (e.g., running, jogging, hockey, soccer, squash, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling, vigorous aerobic dance classes, heavy weight training)		
B. **Moderate physical activity** (not exhausting, light perspiration) (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)		
C. **Mild physical activity** (minimal effort, no perspiration) (e.g., easy walking, yoga, archery, fishing, bowling, lawn bowling, shuffleboard, horseshoes, golf, snowmobiling)		

2. Is the amount of activity you did in the past month less, more, or about the same as your usual physical activity habits?

I am now much less active	*I am now less active*	*I am now about the same*	*I am now more active*	*I am now much more active*
1	2	3	4	5

3. In the past month, was your participation in physical activities limited by a health condition, injury, or disability?

☐ No ☐ Yes If yes: How much did this limit you from getting physical activity?

Slightly	*A little*	*Somewhat*	*Quite a lot*	*Completely*
1	2	3	4	5

Check the types(s) of health conditions that affect your ability to participate in physical activity:

_____Arthritis
_____Knee problems
_____Hip problems
_____Heart condition
_____Cancer
_____Other, specify

4. During the past 12 months, have you spent more than one week confined to a bed or chair as a result of an injury, illness, or surgery?

☐ No ☐ Yes If yes, how many weeks in the last 12 months were you confined to a bed or chair? _______weeks

5. Do you have difficulty doing any of the following activities:

Getting in or out of a bed or a chair? ☐ No ☐ Yes
Walking across a small room without resting? ☐ No ☐ Yes
Walking for 10 minutes without resting? ☐ No ☐ Yes

6. In general, compared to others persons your age, would you say your health is:

Poor	*Fair*	*Good*	*Very Good*	*Excellent*
1	2	3	4	5

The remaining sections in this study ask about your beliefs and behaviours on doing *"regular physical activity"*. *"Regular physical activity"* is defined as doing activities such as brisk walking, recreation, and sporting activities (e.g. jogging, swimming, bicycling, skiing) all at a moderate intensity of a brisk walking pace (or faster). These free-time activities do not include household chores or physical labor on the job.

For moderate activity to be regular, your activity must:

- **add up to a total of 30 minutes or more per day**
- **be done at least 4 days per week**

There are a number of ways that you could reach your 30 minute total. You could, for example:

- **take a half-hour brisk walk or bicycle ride**

  or

- **take three, 10-minute periods of activities; such as a brisk walk for 10 minutes, swimming for 10 minutes and climbing stairs for exercise for 10 minutes, all in the same day**

Section C

Please choose the description that best describes your present physical activity behaviour. Remember regular physical activity equals doing physical activity at least 4 days a week, for 30 minutes each day, at a moderate intensity of a brisk walking pace (or faster).

☐ I presently ***do not get*** regular physical activity and do not plan to do so in the next 6 months

☐ I presently ***do not get*** regular physical activity, but I have been thinking about doing so within the next 6 months.

☐ I presently ***do not get*** regular physical activity, but I plan to in the next 30 days.

☐ I presently ***get*** regular physical activity, but I have only begun doing so within the past 6 months.

☐ I presently ***get*** regular physical activity and have been doing so for longer than 6 months.

Section D

The next questions ask how confident you are about doing regular physical activity in different circumstances. Please choose only one response for each question.

In the next 6 months I am confident that I can participate in regular physical activity:

		Not at all confident	*Not very confident*	*Moderately confident*	*Very confident*	*Extremely confident*
5.	When I am a little tired.	1	2	3	4	5
6.	When I am in a bad mood or feeling depressed.	1	2	3	4	5
7.	When I have to do it by myself.	1	2	3	4	5
8.	When it becomes boring.	1	2	3	4	5
15.	When I can't notice any improvements in my fitness.	1	2	3	4	5
16.	When I have many other demands on my time.	1	2	3	4	5
17.	When I feel a little stiff or sore.	1	2	3	4	5
18.	When the weather is bad.	1	2	3	4	5
19.	When I have to get up early, even on weekends.	1	2	3	4	5
20.	When I have diabetes complications.	1	2	3	4	5
21.	When I have to find different activities due to diabetes complications.	1	2	3	4	5
22.	When I feel a little ill.	1	2	3	4	5
23.	When I have to let others know I have diabetes.	1	2	3	4	5

24. On a scale of 0% to 100%, how likely is it that you will get regular physical activity within the next 6 months?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

15. Currently, have you thought about it and decided not to do any regular physical activity? ☐ Yes ☐ No

Section E

To what extent will the following ideas influence your decision to do regular physical activity over the next 6 months?

Remember, the questions are not asking how much you agree or disagree with these statements, but rather how much each may influence your decision to do regular physical activity over the next 6 months:

	Over the next 6 months:	***Not at all***	***A little***	***Somewhat***	***Quite a lot***	***Very much***
6.	**Physical activity would help me reduce tension or manage stress.**	1	2	3	4	5
7.	**I would feel more confident about my health by getting regular physical activity.**	1	2	3	4	5
8.	**I would sleep better.**	1	2	3	4	5
9.	**Physical activity would take too much of my time.**	1	2	3	4	5
10.	**I would have less time for my family and friends if I participated in physical activity.**	1	2	3	4	5
8.	**I'd be too tired to get physical activity because of my other daily responsibilities.**	1	2	3	4	5
9.	**Physical activity would help me have a more positive outlook.**	1	2	3	4	5

Remember, the questions are not asking how much you agree or disagree with these statements, but rather how much each may influence your decision to do regular physical activity over the next 6 months:

18.	**Physical activity would help me control my weight.**	1	2	3	4	5
19.	**I'd worry about looking awkward if others saw me being physically active.**	1	2	3	4	5
20.	**Participating in physical activity would cost too much money.**	1	2	3	4	5
21.	**Regular physical activity would decrease my chances of having further diabetes complications.**	1	2	3	4	5

Over the next 6 months:		*Not at all*	*A little*	*Somewhat*	*Quite a lot*	*Very much*
22.	Regular physical activity would help control my glucose level.	1	2	3	4	5
23.	Regular physical activity would require that I monitor my blood glucose levels more closely.	1	2	3	4	5
24.	Regular physical activity may lead to an insulin reaction.	1	2	3	4	5
25.	Regular physical activity will require me to let others know I have diabetes.	1	2	3	4	5
26.	Regular physical activity will require me to rely on others if complications occur.	1	2	3	4	5
27.	Regular physical activity would cause me physical injury.	1	2	3	4	5

Section F

During the past month, how often have you had any of the thoughts, experiences, feelings, or activities described by each of the following statements.

How often in the past month:		*Never*	*Seldom*	*Occasionally*	*Often*	*Very often*
6.	Did warnings about the health problems caused by inactivity concern you?	1	2	3	4	5
7.	Did you feel you would be a good role model for others if you were getting regular physical activity?	1	2	3	4	5
8.	Did you notice society changing in ways that make it easier to get regular physical activity?	1	2	3	4	5
9.	Did you think that you would be achieving an important personal goal if you were getting regular physical activity?	1	2	3	4	5
10.	Did you ask someone to help you improve your physical activity skills?	1	2	3	4	5

How often in the past month:		Never	Seldom	Occasionally	Often	Very often
6.	Did you use physical activity to help relieve your stress instead of just worrying about your stress?	1	2	3	4	5
7.	Did you read anything about physical activity to learn more about it?	1	2	3	4	5
8.	Did warnings about physical inactivity being bad for your health worry you?	1	2	3	4	5
9.	Did you feel you were letting yourself down if you didn't get regular physical activity?	1	2	3	4	5
10.	Did you set physical activity goals for yourself that you could reach?	1	2	3	4	5
11.	Did you make sure you have the things you needed in order to get regular physical activity?	1	2	3	4	5
12.	Did you talk to anyone and/or attend a session about the importance of regular physical activity?	1	2	3	4	5
13.	Did you think that you could influence others to be healthier if you were getting regular physical activity?	1	2	3	4	5
14.	Did you notice that the health care system was encouraging patients to get regular physical activity?	1	2	3	4	5
15.	Did you get your regular physical activity instead of doing something else?	1	2	3	4	5
16.	Did you ask someone to give you feedback about your regular physical activity?	1	2	3	4	5
17.	Did you tell yourself that taking care of your body through regular physical activity was a personal accomplishment?	1	2	3	4	5
18.	Did you ask someone to do physical activity with you?	1	2	3	4	5

How often in the past month:	*Never*	*Seldom*	*Occasionally*	*Often*	*Very often*
19. Did you intentionally keep things around your home or workplace to remind you to get regular physical activity?	1	2	3	4	5
20. Did you plan how you would get regular physical activity?	1	2	3	4	5
21. Did you remind yourself about a commitment to get regular physical activity?	1	2	3	4	5
22. Did you tell yourself that getting regular physical activity was preventing diabetes complications?	1	2	3	4	5

Section G

The following are ways that you might feel about diabetes and physical activity. How much do you agree that each of the following statements represents your thoughts about doing regular physical activity over the next 6 months.

	Definitely not	*Probably not*	*Unsure*	*Probably yes*	*Definitely yes*
1 Getting further diabetes complications would be a very bad thing to happen to me.	1	2	3	4	5
2 I am frightened about the possibility of getting further diabetes complications.	1	2	3	4	5
3 My chances of getting further diabetes complications are small.	1	2	3	4	5
4 For me, physical activity will keep me healthy.	1	2	3	4	5
5 For me, physical activity will help me either remain fit or get fit.	1	2	3	4	5
6 For me, physical activity will reduce my chances of getting serious health problems.	1	2	3	4	5
7 I have easy access to places where I can get physical activity.	1	2	3	4	5

Section H

For each of the following statements, please select the word that best represents how you feel about doing regular physical activity over the next 6 months.

For me regular physical activity is:

1.	Quite enjoyable	Slightly enjoyable	Neutral	Slightly unenjoyable	Quite unenjoyable
2.	Quite useful	Slightly useful	Neutral	Slightly useless	Quite useless
3.	Quite wise	Slightly wise	Neutral	Slightly foolish	Quite foolish
4.	Quite interesting	Slightly interesting	Neutral	Slightly boring	Quite boring
5.	Quite relaxing	Slightly relaxing	Neutral	Slightly stressful	Quite stressful
6.	Quite beneficial	Slightly beneficial	Neutral	Slightly harmful	Quite harmful

Section I

How much do you agree or disagree with each statement, choose the number which matches your answer. Not applicable is represented by N/A.

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	
1. Most people in my social network want me to do regular physical activity in the next 6 months.	1	2	3	4	5	
2. Most people in my social network would approve if I did regular physical activity in the next 6 months.	1	2	3	4	5	
3. My doctor or health care provider wants me to participate in regular physical activity in the next 6 months.	1	2	3	4	5	
4. My doctor or health care provider would approve for me to get regular physical activity in the next 6 months.	1	2	3	4	5	
5. Most of my family members participate in regular physical activity.	1	2	3	4	5	
6. Most of my friends participate in regular physical activity.	1	2	3	4	5	
7. My spouse/partner participates in regular physical activity.	1	2	3	4	5	N/A
8. Most of my co-workers participate in regular physical activity.	1	2	3	4	5	N/A

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
9.	People in my social network are likely to help me participate in regular physical activity.	1	2	3	4	5
10.	There is no one in my social network who I can turn to for assistance with regular physical activity.	1	2	3	4	5
11.	I feel that someone in my social network will provide the support I need in order to be regularly physically active.	1	2	3	4	5
12.	Whether or not I participate in regular physical activity is mostly up to me.	1	2	3	4	5

		Absolutely no control	A little control	Some control	A lot of control	Complete control
13.	How much personal control do you feel you have over participating in regular physical activity in the next 6 months?	1	2	3	4	5

		Not at all	A little	Moderately	Quite a lot	Very much
14.	How much do you feel that participating in regular physical activity is beyond your control in the next 6 months?	1	2	3	4	5

Section J

Choose the description that best describes your total physical activity behaviour that you get during your leisure time, household chores, and worktime. Remember regular physical activity equals doing physical activity at least 4 days a week, for 30 minutes each day, at a moderate intensity of a brisk walking pace (or faster).

☐ I presently *do not get* regular physical activity and do not plan to do so in the next 6 months.

☐ I presently *do not get* regular physical activity, but I have been thinking about doing so within the next 6 months.

☐ I presently *do not get* regular physical activity, but I plan to in the next 30 days.

☐ I presently *get* regular physical activity, but I have only begun doing so within the past 6 months.

☐ I presently *get* regular physical activity and have been doing so for longer than 6 months.

During a usual week about how often do you do physical exercise in your free time for at least 20 minutes without stopping, which is hard enough to make your heart rate and breathing increase a large amount?

________ TIMES per week

Section K

The next questions ask about other health behaviours. Please choose one response for each question.

		Yes, for more than 6 months	Yes, for less than 6 months	No, but I intend to within the next 30 days	No, but I intend to within the next 6 months	No, and I do not intend to within the next 6 months
1.	Do you normally choose to buy low-fat versions instead of high-fat versions of food?	1	2	3	4	5
2.	Do you normally cook your meals using techniques to reduce fat?	1	2	3	4	5
3.	Do you normally prepare your food at the table in ways that reduce fat?	1	2	3	4	5
5.	In general, do you consistently avoid eating high-fat foods?	1	2	3	4	5

The next questions ask about your eating habits over the past week. Choose one response for each question (i.e., the number of days). Non applicable = N/A

On how many of the last seven days:

1.	Have you followed a healthy diet?	0	1	2	3	4	5	6	7	
2.	Did you eat five or more servings of vegetables and fruits?	0	1	2	3	4	5	6	7	
3.	Did you eat high fat foods such as processed meat or full-fat dairy products?	0	1	2	3	4	5	6	7	
4.	Did you space carbohydrates (e.g. bread, rice, potatoes) evenly through the day?	0	1	2	3	4	5	6	7	
5.	On average, over the past month, how many days per week have you followed your eating plan?	0	1	2	3	4	5	6	7	N/A

The next questions ask about your prescribed medication habits. Choose one response for each question. Non applicable = N/A

1.	Are you currently on diabetes medication?	☐ Yes ☐ No
2.	On how many of the last seven days did you take your recommended diabetes medication?	0 1 2 3 4 5 6 7 N/A

The next questions ask about your smoking habits. Choose one response for each question.

1. Do you currently smoke cigarettes?

☐ Yes → How many cigarettes do you usually smoke a day? ______

☐ No → Have you ever smoked cigarettes? ☐ Yes ☐ No

Thank you for your time and participation today.
We will be telephoning you again in 6 months time to ask a similar set of questions.

APPENDIX II

Study Two Instruments

INTERVIEW GUIDE

Opening question

1) To me, being physically active means........

2) In a regular week, how physically active are you?

3) Did you become more active, stay the same or less active after you were diagnosed with diabetes?

Primary Questions

Self-Efficacy
4) How confident are you that you can be physically active on a regular basis?
Probe: How confident are you that you can be physically active:
- When you are tired?
- When the weather is bad?
- When I have other demands on my time?

Environment & Situation
5) What kinds of things make it difficult for you to be physically active?
Probes: What make it difficult in your physical, social or personal environment?

6) What kinds of things make it easy for you to be physically active?
Probes: Do you have easy access to a place where you can get regular physical activity?
Probes: Do you receive support for participating in physical activity from family, friends, and medical professionals?

Outcome Expectations & Expectancies
7) How important do you think physical activity is for managing your diabetes?

8) What, if any, positive effects do you think physical activity may have for yourself?
Probe: Do you think PA has any positive effects for your physical health?
Do you think PA has any positive effects for your mental health?
Do you think PA has any positive effects for your diabetes condition?

9) Even if you were very tired and didn't feel like getting out of bed, are any of the benefits of physical activity so important that no matter what, you would be willing to do the activity to achieve the benefits?

10) What, if any, negative effects do you think physical activity may have for yourself?
Probe: Do you think PA has any negative effects for your physical health?
Do you think PA has any negative effects for your mental health?
Do you think PA has any negative effects for your diabetes condition?

11) Are any of the negative effects so significant that it would prevent you from participating in physical activity?

Behavioural Capability

12) When you go see your doctor or diabetes specialist, do you feel that he/she talks to you enough about the role of physical activity in the management of diabetes?

13) Do you feel that you have enough knowledge (about the types of activities you should be engaging in, the intensity) to engage in regular physical activity?
Probe: If yes, where do you think you got this knowledge from?
Probe: If no, what kind of knowledge do you feel you're lacking?

14) Do you feel that you have the skills to perform regular physical activity?
Probe: If yes, how did you acquire these skills?
Probe: If no, what kind of skills do you feel that you're lacking?

Observational Learning

15) Do you think you watch and learn from others about how to be physically active?
Probe: If yes, who do you watch and learn from?

Self-control & Reinforcement & Managing Emotional Arousal

16) Are there any strategies that you use to get yourself to be physically active?
Probe: Have you ever set a goal for yourself?
Probe: Have you ever rewarded yourself for being physically active?
Probe: Have you ever made alternative arrangements if your initial physical activity plans fall through?

Secondary Questions

17) If you had an opportunity to design your own personal physical activity program, what would your ideal program look like?
Probe: Would you like it to be structured or unstructured?
Probe: Would you like any PA tools (i.e. information pamphlets, motivational counseling)?
Probe: Would it be on your own or with a group?
Probe: If in a group, would it be with people of your own gender or mixed?
Probe: Would it be in the morning, afternoon or evening?
Probe: What types of activities would it include?
Probe: Would it be light, medium or high intensity activities?
Probe: Would it be at a facility, or in and around the house?

18) Is there anything else that you would like to tell me about physical activity or your diabetes condition in general?

Closing Questions

19) Are you currently single or married/partnered?

20) Are you currently working?

21) Do you feel that your income is adequate to meet your needs?

22) Do you want a copy of the summarized results from the interviews sent to you by mail?

Study Information Letter

Study Title: Exploring the determinants of physical activity among people with type 2 diabetes: Can we use the Social Cognitive Theory?

Principal Investigator: Jennifer Barrett, MSc (candidate), University of Alberta, (780) 492-1019, jeb4@ualberta.ca

Co-Investigator: Ronald Plotnikoff, PhD, University of Alberta, (780) 492-4372.

Name and address of participant

Dear *name of participant,*

As you may recall, you participated in the Diabetes and Physical Activity Study, which took place between the Spring of 2002 and Fall of 2003. This research was undertaken by Dr. Ronald Plotnikoff from the University of Alberta. Once again, thank-you for your participation and feedback. On the final survey, you indicated that we could contact you again to inform you about future studies. Based on this response, we are asking if you would like to participate in another study.

The purpose of this study is to collect information for a graduate thesis, about people with type 2 diabetes and their physical activity attitudes, beliefs and behaviours. The information collected from this study will help researchers to design and carry out physical activity programs that meet the needs of people with type 2 diabetes. On a personal level, we hope that your participation will increase your awareness and/or get you thinking more about the benefits of physical activity.

Participation in the study will consist of one telephone interview that will take approximately 30 minutes to complete. We will pay for the cost of the telephone call. Throughout the interview you will be asked for your opinions, thoughts and beliefs. There are no right and wrong answers. Your comments are valuable to us and you are encouraged to say what you are truly thinking throughout the interview.

The interview is completely voluntary. At any time, if you feel uncomfortable discussing a topic, you are not required to do so. You are free to stop the interview at any time without consequence. You are also free to withdraw from this study at any time without giving a reason by informing the research coordinator by phone (780) 492-1019, mail (see mailing address at the end of this letter), or e-mail (jeb4@ualberta.ca). If you decide to withdraw from the study, any information you have provided will be removed at your request.

Your privacy and confidentiality will be protected. Only the researchers involved in this study will have access to records, tapes and notes from the interview and they will be kept in a locked lab after the final report is written. Once the final report is written, the information will be kept for a period of five years, after which it will be destroyed. In the final report, your identity will not be revealed and no information will be associated with your name. You can obtain a copy of the report by mail if you would like one. To help us keep an accurate record of what you say, we will ask for your permission at the start of the interview to take notes and tape-record the session.

The negative effects of participating in this study are minimal. The only foreseeable negative effect could be feeling uncomfortable discussing a topic during the interview. This will be minimized by allowing you to stop the interview at any time and seek clarification with the research coordinator. If you feel uncomfortable discussing a topic you do not have to do so, and you may discontinue the interview.

Please find attached a response card, two copies of the consent form and pre-paid return envelope. The response card allows you to indicate your interest in this study, and we would appreciate that you return this card in the pre-paid return envelope.

If you indicate on the response card "yes - I am interested in participating in this study", please return this card and one copy of the completed consent form in the pre-paid return envelope. Once we receive your response card indicating "yes", we will follow-up with you by telephone. This telephone call will give you the opportunity to ask any additional questions, and at this time we can arrange a future convenient date and time to conduct the interview.

If you have any questions, or comments please do not hesitate to contact me at (780) 492-1019 or jeb4@ualberta.ca.

If you have concerns about the study, you may contact Dr. Brian Maraj, Chair of the Faculty Research Ethics Board, at 492-5910 or brian.maraj@ualberta.ca. Dr. Maraj has no direct involvement with this project.

Sincerely,

____

Jennifer Barrett, MSc (candidate)
Centre for Health Promotion Studies
5-10 University Extension Centre
8303 – 112 Street
Edmonton, AB, T6G 2T4

____

Ronald Plotnikoff, PhD
Centre for Health Promotion Studies &
Faculty for Physical Education
University of Alberta

Response Card

Study Title: Exploring the determinants of physical activity among people with type 2 diabetes: Can we use the Social Cognitive Theory?

Principal Investigator: Jennifer Barrett, MSc (candidate), University of Alberta, (780) 492-1019, jeb4@ualberta.ca

Co-Investigator: Ronald Plotnikoff, PhD, University of Alberta, (780) 492-4372.

Please check one of the following:

_________ **YES**, I am interested in participating in this study.

- If yes, when is a convenient time to follow-up with you by telephone?

  ____

- If yes, what is your current telephone number where you wish to be contacted:

  __(____)______________________________________

_________ **NO**, I am not interested in participating in this study or any other studies.

_________ **NO**, I am not interested in participating in this study, but may want to participate in future studies.

Consent Form

Please read and complete both copies, keep one for your information and return the second copy, thank-you!

Title of Project: Exploring the determinants of physical activity among people with type 2 diabetes: Can we use the Social Cognitive Theory?

Principal Investigator: Jennifer Barrett, MSc (candidate), University of Alberta, (780) 492-1019, jeb4@ualberta.ca

Co-Investigator: Ronald Plotnikoff, PhD, University of Alberta, (780) 492-4372.

To be completed by the study participant:

Do you understand that you have been asked to participate in a research study about people with type 2 diabetes and physical activity behaviours?	Yes	No
Have you received and read a copy of the attached information letter?	Yes	No
Do you understand the benefits and the risks involved in taking part in this research study?	Yes	No
Have you had the opportunity to ask questions and discuss this study (Either through telephone or email contact)?	Yes	No
Do you understand that you are free to refuse to participate, or to withdraw from this study at any time, without consequence, and that your information will be withdrawn at your request?	Yes	No
From the information letter, do you understand the issue of confidentiality? and do you understand who will have access to your information?	Yes	No

This study was explained to me by: ______________________________

I agree to take part in this study:

______________________ ________________ ______________________

Signature of Research Participant Date Witness

Printed Name　　Printed Name

I believe that the person signing this form understands what is involved in this research study and voluntarily agrees to participate.

Signature of Investigator or Designee　　Date

Appendix III

Ethical Approval

UNIVERSITY OF ALBERTA

Ethics Proposal No. 2001-0609-02

Ethics Review Approval

The Ethics Committee of the Faculty of Physical Education and Recreation (University of Alberta):

Name	Position
Dr. Wendy Rodgers (Chair)	Associate Professor & Associate Dean (Research)
Dr. Stu Petersen	Associate Professor
Dr. Michael Mauws	Assistant Professor
Dr. Dick Jones	Professor (Pulmonary Medicine)
Dr. PearlAnn Reichwein	Assistant Professor
Mr. Phil Wilson	Graduate Student
Mrs. Mary Andiel	External Member

have reviewed the proposal entitled:

Exercise behaviour of community adults with Type 1 and Type II Diabetes: A prospective examination exercise determinants in a large population-based sample.

Investigator(s): Ronald Plotnikoff, Kerry Courneya, Kim Raine, Ronald Sigal, Nicholas Birkett, Lawrence Svenson

X **Finds it within acceptable standards for human experimentation.**

_____ **Finds it within acceptable standards subject to the following revisions (see below)**

_____ **Revise and resubmit.**

Dr. Wendy Rodgers, Chair, Faculty Ethics Committee
Faculty of Physical Education and Recreation

September 27, 2001
Date

Faculty of Physical Education and Recreation
Office of the Associate Dean (Research)

E-477 Van Vliet Centre • University of Alberta • Edmonton • Canada • T6G 2H9
Telephone: (780) 492-5910 • Fax: (780) 492-6549

UNIVERSITY OF ALBERTA
Faculty of Physical Education and Recreation

E424 Van Vliet Centre
Edmonton, Alberta, Canada T6G 2H9

Faculty of Physical Education and Recreation
Research Ethics Board

Certificate of Ethics Approval for Fully-Detailed Research Proposal

Applicant(s):	**Jennifer Barrett**
Supervisor (if applicable)	**Ron Plotnikoff**
Faculty:	**Physical Education and Recreation**
Project Title:	**Exploring the determinants of physical activity among people with type 2 diabetes: Can we use the Social Cognitive Theory**
Research Ethics Application #:	**2005-0104-06**
Research Ethics Approval Expiry Date:	**January 30, 2006**

Certification of Faculty of Physical Education and Recreation Research Ethics Approval

I have received your application for research ethics review and conclude that your proposed research meets the University of Alberta standards for research involving human participants (GFC Policy Section 66). On behalf of the Faculty of Physical Education and Recreation's Research Ethics Board (FPER REB), I am providing **research ethics approval** for your proposed project.

This research ethics approval is valid for one year. To request a renewal after January 30 2006 please contact me and explain the circumstances, making reference to the research ethics review number assigned to this project (see above). Also, if there are significant changes to the project that need to be reviewed, or if any adverse effects to human participants are encountered in your research, please contact me immediately.

Chair, Research Ethics Board
Faculty of Physical Education and Recreation

Print Name: Dr. Gordon Bell **Signature:** Gordon Bell

Date: Feb 1/05